

REVISION

OWNER/OPERATOR INFORMATION MANUAL

**REVISION 2
13 MARCH 2013**

MPC26-02

The entire manual is provided with this revision.

OWNER/OPERATOR INFORMATION MANUAL



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McCAULEY PROPELLER SYSTEMS
WICHITA, KANSAS, USA

MPC26-02

REVISION 2

7 APRIL 2008

13 MARCH 2013

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LIST OF REVISIONS

1. General

- A. This manual, MPC-26, includes the original issue and the revisions listed in Table 1. To ensure information in this manual is current and the latest maintenance and inspections procedures are available, the revisions must be incorporated in the manual as they are issued.

Table 1. Original Issue -- April 7, 2008

| Revision Number | Date | Revision Number | Date |
|-----------------|-------------|-----------------|--------------|
| 1 | Dec 7, 2009 | 2 | Mar 13, 2013 |

- B. FAA Approved Airworthiness Limitations are incorporated in this maintenance manual as Chapter 4. Revisions to Chapter 4 are dated as approved by the FAA Regional Manager, Aircraft Certification Office. To ensure that the maintenance information required under Parts 43.16 and 91.403 of Part 14 of the Code of Federal Regulations is current, the revisions listed in Table 2 must be incorporated in Chapter 4 as they are issued.

Table 2. Original Issue-- March 13, 2013

| Revision Number | Date | Revision Number | Date |
|-----------------|------|-----------------|------|
|-----------------|------|-----------------|------|

2. Export Compliance

- A. This publication contains technical data and is subject to U.S. export regulations. This information has been exported from the United States in accordance with export administration regulations. Diversion contrary to U.S. law is prohibited.

ECCN: 9E991

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INTRODUCTION

1. General

- A. The instructions for continued airworthiness (ICA) in this publication uses the data available at the time of publication. This publication is updated, supplemented, and changed by service letters, service bulletins, publication revisions, reissues, ICA supplements, and temporary revisions, which are supplied by subscription services available from McCauley Product Support. All of these changes become part of and are specifically included in this publication which is the principal manual for ICA. The latest changes to this publication are given through the McCauley Product Support subscription services and/or McCauley authorized service facilities.

WARNING: The purchaser is warned not to use the data in McCauley's overhaul/maintenance/service/information manuals when parts are designed, manufactured, remanufactured, overhauled, and/or approved by entities, other than McCauley or McCauley authorized entities, are installed. When non-McCauley parts are used, the data in McCauley's overhaul/maintenance/service/information manuals is no longer applicable. All of the inspection intervals, replacement time limits, overhaul time limits, inspection methods, life limits, cycle limits, etc., McCauley recommends are given when new, remanufactured, or overhauled McCauley approved parts are installed. All inspection intervals, replacement time limits, overhaul time limits, the methods of inspection, life limits, cycle limits, etc., for non-McCauley parts must come from the manufacturer and/or seller of the non-McCauley parts.

- B. Inspection, maintenance and parts requirements for Supplemental Type Certificate (STC) installations are not given in this manual. When the propeller has an STC installation, those parts of the propeller that the installation has an effect on, must be examined in accordance with the inspection program published by the owner of the STC. McCauley-supplied inspection criteria may not be valid for propellers that have STC installations because they may change the systems interface, operating characteristics and component loads or stresses on adjacent structures.

WARNING: Any inspection and/or repair requiring disassembly, reassembly or overhaul of a McCauley propeller must be done in an FAA-approved or international equivalent propeller repair station by qualified personnel.

- C. Users of this manual are presumed to have sufficient training to follow these instructions carefully and correctly.
- D. The inspection requirements are stated in a manner to establish what propeller component is to be inspected, preferred inspection method, and criteria for airworthiness.

2. How to Get Customer Assistance

- A. REVISIONS, REISSUES and TEMPORARY REVISIONS can be purchased directly from McCauley:, Attention: Technical Publications, e-mail: customercare@mccauley.textron.com , Telephone 316-517-5800, Telefax 316-517-7271.
- B. Product Support

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| McCauley Product Support | |
|---------------------------------|---|
| Mailing Address | McCauley Propeller Systems 5800 East Pawnee Wichita, KS 67218 |

- (1) If you need assistance with a general support question, publication information, subscriptions, or maintenance programs visit our website at www.mccauley.textron.com or contact:

| McCauley Product Support | |
|---------------------------------|--|
| Phone Numbers | Wichita, Kansas |
| | 1-800-621-7767 or 316-831-4021 |
| Fax | 316-206-9948 |
| Email Address | productsupport@mccauley.textron.com |

3. Coverage

- A. The McCauley MPC26 Owner/Operator Information Manual is prepared with information given by the ATA (Air Transport Association) Specification Number 2200 for Manufacturer's Technical Data.
- B. The information in this Owner/Operator Information Manual is applicable to the following model propellers:

Table 1. Table 1: Propeller Models

| Fixed Pitch Propeller Models | | | | | | |
|---------------------------------|-----------|-----------|-----------|-----------|------------|------------|
| 1A90/CF | 1A90/CH | 1B90/CM | 1B90/ECM | 1B90/FCM | 1B90/LCM | 1C90/ALM |
| 1C90/CLM | 1C90/DLM | 1C90/LF | 1C90/LM | 1A100/ACM | 1A100/MCM | 1A101/DCM |
| 1A101/HCM | 1A101GCM | 1A101/PCM | 1A102/OCM | 1A103/TCM | 1A105/BCM | 1A105/SCM |
| 1A105/SLM | 1A135/BRM | 1A135/CRM | 1A135/DRM | 1A135/JCM | 1A135/KCM | 1A135/RM |
| 1C160/CTM | 1C160/DTM | 1C160/EGM | 1C160/FGM | 1A162/TCD | 1A170/BMS | 1A170/CFA |
| 1A170/DF | 1A170/DM | 1A170/EFA | 1A170/FFA | 1A170/GM | 1A170E/JFA | 1A170E/JHA |
| 1A170/KFA | 1A170/L | 1A170/LL | 1A170/SFA | 1A170/SFC | 1C172/AGM | 1C172/BTM |
| 1C172/EM | 1C172/MDM | 1C172/MFA | 1C172/MGM | 1C172/MTM | 1C172/SBTM | 1C172/TM |
| 1A175/ATM | 1A175/DM | 1A175/ETM | 1A175/FC | 1A175/GM | 1A175/GMA | 1A175/SFC |
| 1B175/MFC | 1A200/AOM | 1A200/DFA | 1A200/FA | 1A200/FM | 1A200/HFA | 1A200/WFA |
| 1B200/HM | 1C200/FC | 1D200/OM | 1A230/AFC | 1B235/BFA | 1B235/DFC | 1B235/EFC |
| 1C235/LFA | 1P235/AFA | 1P235/PFA | | | | |
| Constant Speed Propeller Models | | | | | | |
| 2A34C201 | 2D34C202 | 2A34C203 | C2A34C204 | B2A34C205 | B2D34C206 | B2D34C207 |
| B2D34C208 | 2A34C209 | 2A34C210 | B2D34C211 | B2D34C212 | B2D34C213 | B2D34C214 |
| 2D34C215 | 2A34C216 | B2D34C217 | B2D34C218 | B2D34C219 | B2D34C220 | 2A34C221 |
| 2A37C223 | B2D37C224 | B2A34C225 | 2A34C227 | B2A37C228 | B2D37C229 | D2A37C230 |

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Table 1. Table 1: Propeller Models (continued)

| | | | | | | |
|------------------|------------------|------------------|------------------|-------------|------------|------------|
| D2A37C231 | 2A37C232 | E2A37C233 | E2A37C234 | B2D34C235 | C2D37C236 | B2A37C238 |
| 2A34C239 | 2A34C240 | 2A34C241 | | | | |
| D2AF34C301 | D2AF34C302 | D2AF34C303 | D2AF34C304 | D2AF34C305 | 2AF34C306 | D2AF34C307 |
| D2AF34C308 | D2AF34C310 | | | | | |
| D3A34C401 | D3A34C402 | D3A34C403 | D3A34C404 | B3D34C405 | 3A32C406 | B3D32C407 |
| D3A32C408 | D3A32C409 | D3A36C410 | D3A32C411 | B3D32C412 | B3D34C413 | B3D32C414 |
| C3D36C415 | B3D36C416 | B3D32C417 | 3A32C418 | B3D32C419 | D3A34C420 | B3D34C421 |
| 3A34C422 | 3A34C423 | B3D36C424 | B3D36C427 | B3D36C428 | B3D36C429 | D3A36C430 |
| B3D36C431 | B3D36C432 | B3D36C433 | 3A36C434 | D3A36C435 | D3A36C436 | B3D36C442 |
| D3A34C443 | D3A34C444 | D3A34C447 | | | | |
| 3FF32C501 | 3AF34C502 | 3AF34C503 | 3AF32C504 | 3AF32C505 | 3AF32C506 | 3AF32C507 |
| 3AF32C508 | 3AF32C509 | 3AF37C510 | 3AF32C511 | 3AF32C512 | 3AF36C514 | 3AF32C515 |
| 3AF37C516 | 3AF32C521 | 3AF32C522 | 3AF32C523 | 3AF32C524 | 3AF32C525 | B3DF36C526 |
| B3DF36C527 | 3AF32C528 | 3FF34C529 | | | | |
| 3GFR34C601 | 3GFR34C602 | 4HFR34C652 | 4HFR34C653 | 4HFR34C661 | 4HFR34C662 | 4HFR34C663 |
| 4HFR34C664 | 4HFR34C665 | | | | | |
| 3GFR34C701 | 3GFR34C702 | 3GFR34C703 | 3GFR34C704 | 4HFR34C754 | 4JFR34C758 | 4HFR34C762 |
| 4HFR34C763 | 4HFR34C764 | 4HFR34C766 | 4HFR34C768 | 4HFR34C769 | 4HFR34C771 | 4HFR34C773 |
| 4HFR34C774 | 4HFR34C775 | | | | | |
| 5JFR36C1003 | 5HFR34C1008 | | | | | |
| B5JFR36C110 1 | C5JFR36C110 2 | B5JFR36C110 3 | C5JFR36C110 4 | 5HFR34C1105 | | |

- C. This manual gives the necessary information required to help maintenance personnel service, examine, troubleshoot, remove and install McCauley Propellers.
- D. Information in this manual is applicable to all U.S. and Foreign Certified propellers.

4. Instructions for Continued Airworthiness (ICA)

A. Owner/Operator Information Manual

- (1) The instructions provided in this manual are the principal instructions for continued airworthiness. This manual may be revised to add changes to the ICAs or to add additional ICAs when changes to an affected propeller type design require changes to these instructions. When a revision to this manual is not possible within the time constraints for these ICAs, the instructions may be transmitted with a temporary revision or with an ICA supplement. Temporary revisions will be incorporated in the next revision to this manual and ICA supplements will also be incorporated in the next revision unless these instructions require restricted distribution.

B. Temporary Revisions

- (1) Temporary revisions may be produced to transmit supplemental instructions for continued airworthiness when a revision to the owner/operator information manual is not possible within the time constraints for these ICAs. They consist of complete page blocks which replace the existing paper and will temporally supersede the CD-ROM data. Temporary revisions will be

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included on the CD-ROM on the next CD-ROM release. Temporary revisions are numbered consecutively in the ATA chapter assignment. Page numbering uses the three-element number, which matches the owner/operator information manual.

- (2) Paper Version of the owner/operator information
 - (a) Paper temporary revisions will be distributed on yellow paper. File the temporary revision cover sheet after the title page of the chapter to which it applies and substitute or add the remaining pages in the paper manual.
- (3) Electronic (Cesview) Version of the Maintenance Manual.
 - (a) The cover sheet will be located in the maintenance manual Cesview library at the beginning of the chapter to which it applies and the changed or added pageblocks will be located in the appropriate location by ATA. All revised or added information will be highlighted blue.

C. ICA Supplements

- (1) ICA supplements may be produced to transmit supplemental instructions for continued airworthiness when a revision to the owner/operator information manual is not possible within the time constraints for these ICAs. ICA supplements will provide supplemental instructions for one or more ICA manual and is to be used in conjunction with the affected manuals (maintenance manual, wiring diagram manual, etc.) until those instructions are incorporated into the manuals. ICA supplements are numbered consecutively by model in the ATA chapter assignment. Page numbering uses the three-element number, which matches the affected manuals.
- (2) Refer to the ICA Supplement List to determine the incorporation status for each manual affected.

5. List of Obsolete Documents

- A. The following service information has been incorporated into this manual. This service information is now obsolete and replaced by this manual for the propellers affected by this manual.

| Service Bulletin Number | Service Bulletin Date | Manual Incorporation |
|-------------------------|-----------------------|----------------------|
| SB137AE | 2/17/10 | Revision 2 |
| SB176E | 3/3/03 | Revision 2 |
| SB177B | 6/30/92 | Revision 2 |
| SB227B | 8/28/01 | Revision 2 |

| Service Letter Number | Service Letter Date | Manual Incorporation |
|-----------------------|---------------------|----------------------|
| SL1991-10A | 10/29/96 | Revision 2 |
| 1992-14C | 6/28/96 | Revision 2 |
| 1992-17 | 11/16/92 | Revision 2 |
| 1994-24A | 2/10/95 | Revision 2 |
| 1995-5A | 12/5/07 | Revision 2 |
| 1996-7 | 10/29/96 | Revision 2 |
| 1997-4 | 4/22/97 | Revision 2 |
| SL1998-23 | 9/21/98 | Revision 2 |
| 1999-8B | 3/15/01 | Revision 2 |
| 2000-7 | 8/1/00 | Revision 2 |
| 2000-8A | 11/20/00 | Revision 2 |
| 2003-8 | 12/23/03 | Revision 2 |

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6. List of Incorporated Documents

- A. The following service information has been incorporated into this manual. Due to the relationship of the service information to active Airworthiness Directives, the service information also remains active.

| Service Bulletin Number | Service Bulletin Date | Manual Incorporation | Airworthiness Directive Number |
|-------------------------|-----------------------|----------------------|--------------------------------|
|-------------------------|-----------------------|----------------------|--------------------------------|

7. Applicable Service Bulletins and Service Letters

- A. Alert Service Bulletin
- (1) Alert Service Bulletins are technical documents that provide instructions and, if applicable, part information for the incorporation of an installation, modification, or repair to a specific propeller or propeller component. Alert Service Bulletins are used to announce mandatory special product inspection criteria and modifications, revised maintenance information and/or revised operational information which has been determined to be critical for the continued safe and reliable performance of the propeller, or propeller component.
- B. Service Bulletin
- (1) Service Bulletins are technical documents that provide instructions and, if applicable, part information for the incorporation of an installation, modification, or repair to a specific propeller or propeller component. Service Bulletins are used to announce special product inspection criteria and modifications, revised maintenance information and/or revised operational information which has been determined to be critical for the continued safe and reliable performance of the propeller, or propeller component.
- C. Service Letter
- (1) Service Letters are used to announce support and service information.
- D. Special Service Project
- (1) Special Service Projects (SSP's) are similar to service bulletins and are used to announce special product inspection criteria and modifications, revised maintenance information and/or revised operational information which is intended to assist in improving propeller safety, reliability, durability and/or performance. SSP's typically contain similar information and/or headings as service bulletins, but are often tailored for special situations and/or conditions or logistical requirements that may affect only a limited number of propellers. One additional heading that can be found on a SSP is the heading titled "Duration". The Duration heading provides an expiration date for the SSP when used.

8. Cross Reference Listing of Popular Name Verses Model Numbers

- A. All propellers are certified under model number designations. However, in this manual reference to specific propellers is almost always by the shortened propeller model number unless the full model number is necessary to differentiate between versions of the same basic model.

Example: the D3A34C444/78ML[X] propeller assembly is shortened to the Hub model designation D3A34C444 which can also be shortened to C444.

9. Using the Owner/Operator Information Manual

- A. Division of Subject Matter.
- (1) This manual is divided into two chapters which are divided by section and subject. The manual divisions are as follows:

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| Chapter-Section-Subject | Title |
|-------------------------|---------------------------|
| | Introduction |
| 4-00-00 | Airworthiness Limitations |
| 4-10-00 | Inspection Time Limits |
| 4-11-00 | Replacement Time Limits |
| 61-00-01 | Fixed Pitch Propeller |
| 61-00-04 | Constant Speed Propeller |
| 61-00-06 | Propeller |

B. Page Numbering System.

- (1) All system/subsystem/unit (chapter/section/subject) maintenance data is separated into specific types of information: description and operation, troubleshooting, maintenance practices. Blocks of sequential page numbers are used to identify the type of information:

| | |
|----------------------|---------------------------|
| Page 1 through 99 | Description and Operation |
| Page 101 through 199 | Troubleshooting |
| Page 201 through 299 | Maintenance Practices |

- (2) Relatively simple units may not require description and operation, troubleshooting information. In such cases, these pages are omitted. When subtopics are brief, they may be combined into a topic entitled Maintenance Practices. Maintenance Practices is actually a combination of subtopics, including Servicing, Removal/Installation, Adjustment/Test, Cleaning/Painting or Approved Repairs.
- (3) Lengthy subtopics may be treated as an individual topic. Page numbering for the individual topics is as follows:

| | |
|----------------------|----------------------|
| Page 301 through 399 | Servicing |
| Page 401 through 499 | Removal/Installation |
| Page 501 through 599 | Adjustment/Test |
| Page 601 through 699 | Inspection/Check |
| Page 701 through 799 | Cleaning/Painting |
| Page 801 through 899 | Approved Repairs |

- (4) Illustrations are tied into the page numbering system. For example, all illustrations within a 200 page numbering section will begin with the number 2 (i.e. Figure 201, Figure 202, etc.). All illustrations within a 300 page numbering section will begin with the number 3 (Figure 301, Figure 302, etc.).

10. Dimensions and Units

A. Dimensions and Units.

- (1) All dimensions and units are given in both English and metric (International System of Units [SI]) units in the text and the illustrations. The English value is given and then the metric unit is given in parenthesis.
- (2) Metric units are given in standard abbreviations.
- (3) Station lines and locations are not given in metric units.

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11. Temporary Revisions

- A. Additional information which becomes available may be provided by temporary revision. This service is used to provide, without delay, new information which will assist in maintaining safety. Temporary revisions are numbered consecutively within the ATA chapter assignment. Temporary revisions are normally incorporated into the manual at the next regularly scheduled revision.

12. Material Presentation

- A. This manual is available on paper and CD.

13. Service Bulletins

- A. Service bulletins may require special inspections and authorize modifications to propellers. As service bulletins are issued, they will be incorporated in the next scheduled revision and noted in the Service Bulletin List, included in this Introduction. The list of service bulletins uses three columns to summarize information:
 - (1) Service Bulletin Number - This column identifies the bulletin by number.
 - (2) Service Bulletin Date - This column indicates the initial date the bulletin became active.
 - (3) Manual Incorporation - This column indicates the date the service bulletin has been incorporated in the manual.

14. List of Effective Pages

- A. A list of effective pages is provided at the beginning of each chapter. All pages in the specific chapter are listed in numerical sequence on the Effectivity Page(s) with the date of issue for each page.

15. Revision Filing Instructions

- A. Regular Revision
 - (1) Pages to be removed or inserted in the manual are determined by the effectivity page. Pages are listed by the three-element number (chapter/section/subject) and then by page number. When two pages display the same three-element number and page number, the page with the most recent Date of Page Issue shall be inserted in the manual. The date column on the corresponding chapter effectivity page shall verify the active page.
- B. Temporary Revision
 - (1) File temporary revisions in the applicable chapter(s) in accordance with filing instructions appearing on the first page of the temporary revision.
 - (2) The rescission of a temporary revision is accomplished by incorporation into the manual or by a superseding temporary revision. A Record of Temporary Revisions is furnished in the Temporary Revision List located previous to the Introduction. A Manual Incorporation Date column on the Temporary Revision List page will indicate the date the Temporary Revision was incorporated, thus authorizing the rescission of the temporary revision.

16. Identifying Revised Material

- A. Additions or revisions to text in an existing section will be identified by a revision bar in the left margin of the page and adjacent to the change.

NOTE: Due to the extensive changes and reformatting in revision 2 of this manual, all change bars have been omitted for this revision.

- B. Revised text inside tables, including Appendices, will not display revision bars; however, the affected page will display the current revision date in the Date of Page Issue location.
- C. When extensive technical changes are made to text in an existing section that requires extensive revision, revision bars will appear the full length of text.
- D. When art in an existing illustration is revised, a revision bar along the entire vertical length of one side of the illustration will be used to indicate changes to the illustration.

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17. Warnings, Cautions and Notes

- A. Throughout the text in this manual, warnings, cautions and notes pertaining to the procedures being accomplished are included. These adjuncts to the text are used to highlight or emphasize important points. Warnings and Cautions precede the text to which they apply, and Notes follow the text to which they apply.
- (1) **WARNING** - Calls attention to use of materials, processes, methods, procedures or limits which must be followed precisely to avoid injury or death to persons.
 - (2) **CAUTION** - Calls attention to methods and procedures which must be followed to avoid damage to equipment.
 - (3) **NOTE** - Calls attention to methods which will make the job easier.

18. Log Book

- A. The owner/operator is required to maintain a permanent log book for each serial numbered propeller assembly containing the following information:
- (1) The total time (flight hours) in service of each propeller assembly including flight hours on each serial numbered hub and blade.
 - (2) The airplane on which the propeller has been installed. (Recorded by the airplane manufacturer, registration number (tail number), aircraft serial number, and model types.)
 - (3) The time in service (flight hours) and the calendar period (months, days, years) each propeller assembly (recorded by hub and blade serial numbers) was installed on an aircraft.
 - (4) Records of the maintenance, inspections, alterations and overhauls performed on each propeller assembly.
 - (a) The records must include:
 - 1 A description of the work performed, including the disposition of the affected parts.
 - 2 The date that the work was accomplished.
 - 3 The signature and certification number of the person approving the propeller assembly for return to service.

19. Customer Comments on Manual

- A. McCauley Propeller Systems has endeavored to furnish you with an accurate, useful, and up-to-date manual. This manual can be improved with your help. Please return the registration card to receive revisions to this manual. Please contact McCauley Product Support to report any errors, discrepancies, and omissions in this manual as well as any general comments you wish to make.

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ICA SUPPLEMENT LIST

| ICA Supplement Number | Title | ICA Supplement Date | Manual Incorporation Date |
|----------------------------------|--------------|------------------------------------|--|
|----------------------------------|--------------|------------------------------------|--|


NOTE: No ICA Supplements have been issued that affect this manual.

CHAPTER

4

AIRWORTHINESS LIMITATIONS

THE AIRWORTHINESS LIMITATIONS SECTION IS FAA APPROVED AND GIVES INSPECTIONS AND MAINTENANCE THAT ARE REQUIRED BY PARTS 43.16 AND 91.403 OF TITLE 14 OF THE CODE OF FEDERAL REGULATIONS, UNLESS AN ALTERNATIVE PROGRAM HAS BEEN FAA APPROVED.

APPROVED BY 

Margaret Kline, Manager
Aircraft Certification Office
Federal Aviation Administration
Wichita, Kansas

DATE OF APPROVAL 13 March 2013

13 MARCH 2013

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Margaret Kline, Manager
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Federal Aviation Administration
Wichita, Kansas

DATE OF APPROVAL

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AIRWORTHINESS LIMITATIONS - GENERAL

1. Scope

- A. This chapter outlines the mandatory replacement times and inspection intervals for propeller components considered to be life limited, or to require monitoring through scheduled inspections. This chapter applies to items such as fatigue components and structures that are considered a part of the certification process.

NOTE: The Airworthiness Limitations section is FAA Approved and specifies maintenance required by 14 CFR 43.16 and 91.403, unless an alternative program has been FAA approved.

2. Definition

- A. This chapter contains two sections as outlined below.
- (1) Inspection Time Limits (4-10-00) describes and lists components that are required to be inspected at specified intervals. The intervals specified represent the maximum time allowable between inspections.
 - (2) Replacement Time Limits (4-11-00) describes and lists life limited components that are to be replaced at a specific time.

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INSPECTION TIME LIMITS

1. General

- A. The inspection time intervals for the following components represent the maximum inspection intervals which must be adhered to.
- B. The inspections required by this publication require disassembly and checks required in the overhaul manual.

2. Inspection Schedule

- A. Fixed Pitch Propellers
 - (1) Refer to Table 1., Fixed Pitch Propeller Inspection Time Limits for a list of propellers that have an inspection time limit.

Table 1. Fixed Pitch Propeller Inspection Time Limits.

| <i>Propeller Model Designation</i> | <i>Description</i> | <i>Inspection Time Limit</i> |
|---|---|---|
| 1A103/TCM | Propeller Fluorescent Dye Penetrant Inspect (Applies to 1A103/TCM propellers only. Refer to McCauley Alert Service Bulletin ASB221E, and Federal Aviation Administration Airworthiness Directive AD 2010-04-05 for propeller inspection procedures.) | Initial inspection shall occur prior to 1500 hours of operation. Repeat the inspection every 750 hours of operation. NOTE: If time-since-new (TSN) is unknown, inspect the propeller within 50 operating hours of the effective date of AD 2010-04-05. |
| 1A170/FFA | Propeller Fluorescent Dye Penetrant Inspect (Applies to 1A170/FFA propellers only. Refer to Federal Aviation Administration Airworthiness Directive AD 82-27-01 for propeller inspection procedures.) | Inspect every 200 hours of operation. |

- B. Constant Speed Propellers
 - (1) Propeller Blades
 - (a) Refer to Table 2., Propeller Blade Inspection Time Limits for a list of propeller blades that have an inspection time limit.

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Table 2. Propeller Blade Inspection Time Limits.

| <i>Propeller Model Designation</i> | <i>Inspection Time Limited Component Part Number</i> | <i>Description</i> | <i>Inspection Time Limit</i> |
|---|---|---|---|
| C653 | L106FA-0 | Propeller Blade Fluorescent Dye Penetrant or Eddy Current Inspect (Applies to 4HFR34C653/L106FA-0 propeller assemblies only. Refer to McCauley Alert Service Bulletin ASB234 and Federal Aviation Administration Airworthiness Directive AD 2000-15-10 for propeller blade inspection procedures.) | Inspect every 600 hours of operation. |
| C1101 | 114GCA-0 | Propeller Blade Fluorescent Dye Penetrant and Eddy Current Inspect (Applies to B5JFR36C1101/114GCA-0 propeller assemblies only. Refer to McCauley Alert Service Bulletin ASB255A and Federal Aviation Administration Airworthiness Directive AD 2009-19-04 for propeller blade inspection procedures.) | Inspect at 2,500 hours Total Time In Service (TTIS) |
| C1102 | L114GCA-0 | Propeller Blade Fluorescent Dye Penetrant and Eddy Current Inspect (Applies to C5JFR36C1102/L114GCA-0 propeller assemblies only. Refer to McCauley Alert Service Bulletin ASB255A and Federal Aviation Administration Airworthiness Directive AD 2009-19-04 for propeller blade inspection procedures.) | Inspect at 2,500 hours Total Time In Service (TTIS) |
| C1103 | 114HCA-0 | Propeller Blade Fluorescent Dye Penetrant and Eddy Current Inspect (Applies to B5JFR36C1103/114HCA-0 propeller assemblies only. Refer to McCauley Alert Service Bulletin ASB255A and Federal Aviation Administration Airworthiness Directive AD 2009-19-04 for propeller blade inspection procedures.) | Inspect at 2,500 hours Total Time In Service (TTIS) |
| C1104 | L114HCA-0 | Propeller Blade Fluorescent Dye Penetrant and Eddy Current Inspect (Applies to C5JFR36C1104/L114HCA-0 propeller assemblies only. Refer to McCauley Alert Service Bulletin ASB255A and Federal Aviation Administration Airworthiness Directive AD 2009-19-04 for propeller blade inspection procedures.) | Inspect at 2,500 hours Total Time In Service (TTIS) |

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- (2) Propeller Hubs
 - (a) There are no inspection time limits for the propeller hubs.

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REPLACEMENT TIME LIMITS

1. General

- A. Components that have reached the replacement times listed must be permanently withdrawn from service.

2. Blade Life Limits

- A. Refer to Table 1, Propeller Blade Life Limits for a list of propeller blades that are life limited.

Table 1. Propeller Blade Life Limits

| <i>Propeller Model Designation</i> | <i>Life Limited Component Part Number</i> | <i>Description</i> | <i>Life Limit</i> |
|---|--|--|---|
| C406 | 82NDB-X | Propeller Blade | Replace 10,000 hours |
| C409 | 82NDB-X | Propeller Blade | Replace 10,000 hours |
| C653 | L106FA-0 Blades with <u>no</u> change letter | Propeller Blade (Applies only to 4HFR34C653 propeller assembly blades that are installed on or blades that ever have been installed on Jetstream Series 3200 aircraft or the service history is unknown.) | Remove from service, life limit has expired. |
| C653 | L106FA-0 Blades <u>with</u> change letter "A" | Propeller Blade (Applies only to 4HFR34C653 propeller assembly blades that are installed on or blades that ever have been installed on Jetstream Series 3200 aircraft or the service history is unknown.) | Replace 16,000 hours |
| C663 | L106KA-0 | Propeller Blade (Applies to 4HFR34C663 propeller assemblies only.) | Replace 16,000 hours |
| C665 | L106FRA-0 | Propeller Blade (Applies to 4HFR34C665 propeller assemblies only.) | Replace 10,000 hours |
| C1101 | 114GCA-0 | Propeller Blade (Applies to B5JFR36C1101/114GCA-0 propeller assemblies only. Refer to McCauley Alert Service Bulletin ASB255A, and Federal Aviation Administration Airworthiness Directive AD 2009-19-04.) | Replace 3500 hours |

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Table 1. Propeller Blade Life Limits (continued)

| <i>Propeller Model Designation</i> | <i>Life Limited Component Part Number</i> | <i>Description</i> | <i>Life Limit</i> |
|---|--|---|--------------------------|
| C1102 | L114GCA-0 | Propeller Blade (Applies to C5JFR36C1102/L114GCA-0 propeller assemblies only. Refer to McCauley Alert Service Bulletin ASB255A and Federal Aviation Administration Airworthiness Directive AD 2009-19-04.) | Replace 3500 hours |
| C1103 | 114HCA-0 | Propeller Blade (Applies to B5JFR36C1103/114HCA-0 propeller assemblies only. Refer to McCauley Alert Service Bulletin ASB255A and Federal Aviation Administration Airworthiness Directive AD 2009-19-04.) | Replace 3500 hours |
| C1104 | L114HCA-0 | Propeller Blade (Applies to C5JFR36C1104/L114HCA-0 propeller assemblies only. Refer to McCauley Alert Service Bulletin ASB255A and Federal Aviation Administration Airworthiness Directive AD 2009-19-04.) | Replace 3500 hours |

3. Hub Life Limits

- A. Refer to Table 2, Propeller Hub Life Limits for a list of propeller hubs that are life limited.

Table 2. Propeller Hub Life Limits

| <i>Propeller Model Designation</i> | <i>Life Limited Component Part Number</i> | <i>Description</i> | <i>Life Limit</i> |
|---|--|---|--------------------------|
| C406 | D-5868 | Hub Assembly | Replace 10,000 hours |
| C406 | D-7479 | Hub Assembly | Replace 10,000 hours |
| C409 | D-5872 | Hub Assembly | Replace 10,000 hours |
| C409 | D-7740 | Hub Assembly | Replace 10,000 hours |
| C665 | D-6153 | Hub Assembly | Replace 10,000 hours |
| C1101 | D6713-1 | Hub Assembly (Applies to B5JFR36C1101/114GCA-0 propeller assemblies only) | Replace 6000 hours |
| C1102 | D6713-2 | Hub Assembly (Applies to C5JFR36C1102/L114GCA-0 propeller assemblies only) | Replace 6000 hours |
| C1103 | D6713-3 | Hub Assembly (Applies to B5JFR36C1103/114HCA-0 propeller assemblies only) | Replace 6000 hours |
| C1104 | D6713-4 | Hub Assembly (Applies to C5JFR36C1104/L114HCA-0 propeller assemblies only) | Replace 6000 hours |

CHAPTER

61

PROPELLERS

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|----------------------------------|-----------------|-------------|
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| 61-List of Effective Pages | | |
| 61-Record of Temporary Revisions | | |
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| 61-00-04 | Pages 1-19 | Mar 13/2013 |
| 61-00-06 | Pages 101-109 | Mar 13/2013 |
| 61-00-06 | Pages 201-205 | Mar 13/2013 |
| 61-00-06 | Pages 401-425 | Mar 13/2013 |
| 61-00-06 | Page 501 | Mar 13/2013 |
| 61-00-06 | Pages 601-617 | Mar 13/2013 |
| 61-00-06 | Pages 701-711 | Mar 13/2013 |
| 61-00-06 | Pages 801-808 | Mar 13/2013 |
| 61-00-06 | Pages 1001-1005 | Mar 13/2013 |

RECORD OF TEMPORARY REVISIONS

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FIXED PITCH PROPELLER DESCRIPTION

1. Metal Fixed Pitch Propellers

- A. The propellers of this model series are manufactured of one-piece anodized aluminum alloy and have a fixed pitch.

NOTE: Some fixed pitch propellers are certified with a defined spacer. Refer to Propeller Installation Parts List, Table 1003, Installation Parts for Fixed Pitch Propellers for the correct part number spacer for each applicable propeller model.

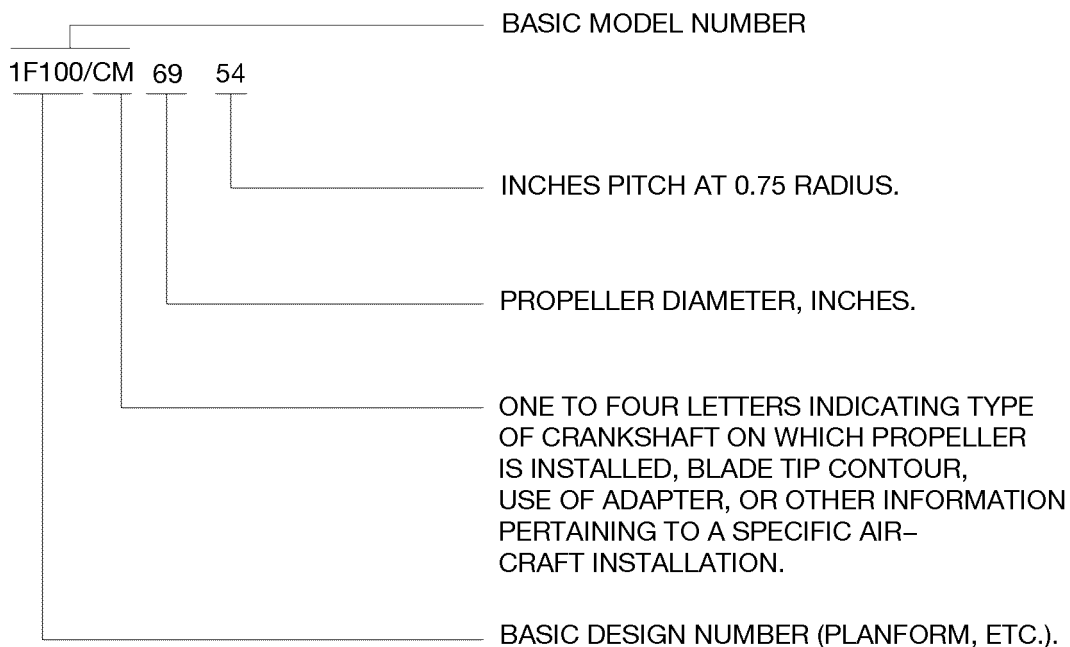
- B. For identification, the hub of each propeller is stamped with the complete model number, serial number, Federal Aviation Agency (FAA) type certificate number, production certification number, and the number of times the propeller has been reconditioned. The complete model number is a combination of the basic model number and suffix numbers to indicate the propeller diameter and pitch.

(1) Propeller Model Designation

- (a) The hub model designation is steel stamped on the forward/camber side/face of the propeller hub.

1 Example of hub model designation:

C1390



- C. Consult the FAA TC Data Sheets for details relating to approved engine/propeller/airplane installations of fixed pitch propellers covered in this manual.

D. Propeller Mounting Torque

- (1) Refer to Propeller - Removal/Installation for the correct installation instructions and torque values for the propeller mounting hardware.

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- E. Propeller Strike or Sudden Engine Stoppage
(1) Refer to Necessary Actions Following Object Strike of Stationary Propeller, Blade Strike of Rotating Propeller, Bird Strike, or Sudden Engine Stoppage for the inspection requirements following a propeller "strike" type event.
- F. Lightning Strike
(1) Refer to Lightning Strike Inspection Requirements for the inspection requirements following a suspected propeller Lightning strike type event.
- G. Definitions of Propeller Maintenance:
(1) Overhaul. This term denotes a complete tear-down and reassembly which is not necessarily applicable to a fixed pitch propeller. The terms "overhaul" and "reconditioning" are sometimes used synonymously for a fixed pitch propeller. The overhaul of a propeller requires the propeller to be inspected for conformity to a fixed set of dimensions and is required on a predetermined interval while reconditioning can occur on an as needed basis.
(2) Reconditioning. The repair of blade damage caused by erosion or striking small objects during normal operation. The propeller shall be fluorescent dye penetrant inspected, refinished, and rebalanced. Reconditioning is accomplished on an irregular basis as necessary and required.

NOTE: Refer to Non-Destructive Inspection Procedures for fluorescent dye penetrant inspection procedures.

- (3) Repair. The correction on an irregular basis as necessary, of damage that has occurred to the propeller. The amount, degree, and extent of damage determines whether or not the propeller can be repaired without refinishing or removing the propeller from the engine. If a propeller is bent or twisted, the repair is major and reconditioning or overhaul of the propeller must be accomplished.
- (4) Frequency of Overhaul. Refer to Time Between Propeller Overhaul for required propeller overhaul intervals. Propellers shall also be overhauled or repaired as required for blade surface conditions. The propeller mounting bolt torque should be checked at least once a year. Propeller mounting bolts must be magnetic particle inspected in accordance with ASTM E-1444 or replaced whenever the propeller is removed from the engine.

2. Blade Serial Number Stamping Information

- A. Blade serial number information is stamped on the hub. (Refer to Figure 1).

Table 1. Blade Year of Manufacture Code

| | | | | |
|----------|----------|-----------|-----------|-----------|
| A = 1980 | L = 1991 | W = 2002 | AH = 2013 | AS = 2024 |
| B = 1981 | M = 1992 | X = 2003 | AI = 2014 | AT = 2025 |
| C = 1982 | N = 1993 | Y = 2004 | AJ = 2015 | AU = 2026 |
| D = 1983 | O = 1994 | Z = 2005 | AK = 2016 | AV = 2027 |
| E = 1984 | P = 1995 | AA = 2006 | AL = 2017 | AW = 2028 |
| F = 1985 | Q = 1996 | AB = 2007 | AM = 2018 | AX = 2029 |
| G = 1986 | R = 1997 | AC = 2008 | AN = 2019 | AY = 2030 |
| H = 1987 | S = 1998 | AD = 2009 | AO = 2020 | AZ = 2031 |
| I = 1988 | T = 1999 | AE = 2010 | AP = 2021 | |
| J = 1989 | U = 2000 | AF = 2011 | AQ = 2022 | |
| K = 1990 | V = 2001 | AG = 2012 | AR = 2023 | |

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DESIGNATES THE BLADE
 PASSED EDDY CURRENT
 INSPECTION AFTER
 MANUFACTURE

TYPE
 CERTIFICATE
 NUMBER

MODEL DESIGNATION
 LINE 2 INCLUDES
 DIAMETER AND PITCH

NUMBER 1
 BLADE

(NOTE)

TYPE
 CERTIFICATE
 NUMBER

DESIGNATES THE BLADE
 PASSED EDDY CURRENT
 INSPECTION AFTER
 MANUFACTURE

NUMBER 1
 BLADE

MODEL DESIGNATION
 LINE 2 INCLUDES
 DIAMETER AND PITCH

TYPICAL 6 BOLT HOLE PROPELLER
 STAMPING PATTERN

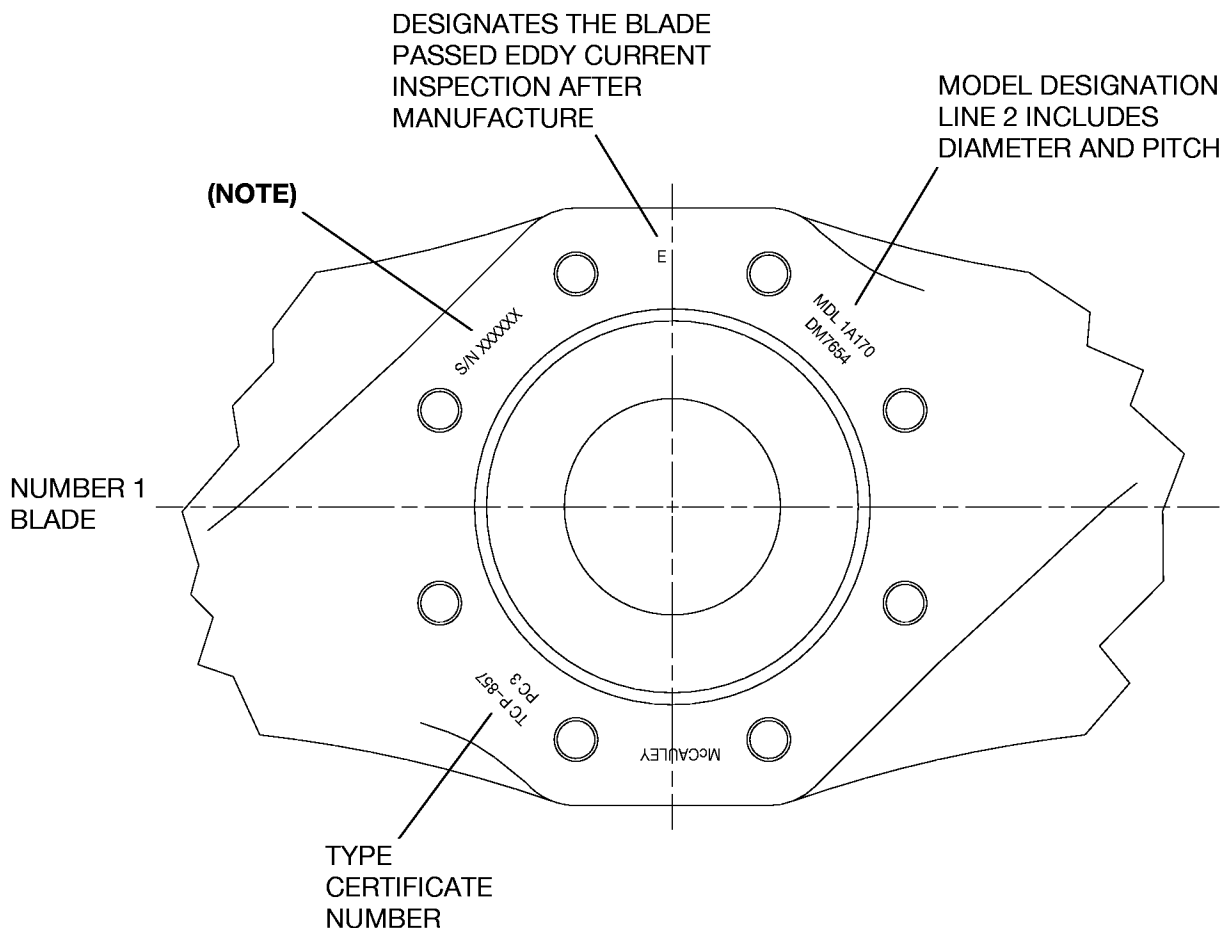
NOTE: STAMPING ARRANGEMENT OR LOCATION OF
 THE SERIAL NUMBER IS OPTIONAL. LETTERING
 MAY BE ARCHED OR STRAIGHT, BUT THE SERIAL
 NUMBER STAMPING IS FOUND AT THE NUMBER
 1 BLADE.

0101T1151

Fixed Pitch Blade Stamping
 Figure 1 (Sheet 1)

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TYPICAL 8 BOLT HOLE PROPELLER
STAMPING PATTERN

NOTE: STAMPING ARRANGEMENT OR LOCATION OF THE SERIAL NUMBER IS OPTIONAL. LETTERING MAY BE ARCHED OR STRAIGHT, BUT THE SERIAL NUMBER STAMPING IS FOUND AT THE NUMBER 1 BLADE.

0101T1152

Fixed Pitch Blade Stamping
Figure 1 (Sheet 2)

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Table 2. Blade Month of Manufacture Code

| | | |
|--------------|------------|---------------|
| A = January | E = May | I = September |
| B = February | F = June | J = October |
| C = March | G = July | K = November |
| D = April | H = August | L = December |

- (1) Blade serial numbers assigned before 1980:
 - (a) Prior to 1980, no calendar date information was encoded in the propeller serial number.
 - (b) Initially, the serial number was a 4 digit number and the numbers were assigned in ascending order.
 - (c) Eventually, the serial number became a 7 digit number.
 - (d) Not all serial numbers are sequential, there are large breaks between assigned propeller serial numbers.
- (2) Blade serial numbers assigned after 1980 and before June 15, 2000:
 - (a) The first letter represents the year of manufacture.
 - (b) The second letter represents the month of manufacture.
 - (c) The following digits represent the number of the blade manufactured during the month of manufacture.
- (3) Blade serial numbers assigned after June 15, 2000:
 - (a) The first or first and second letters represent the year of manufacture.
 - (b) The second, or third, letters represent the month of manufacture.
 - (c) The first two digits represent a reference forging model.
 - (d) The following digits represent the number of the blade manufactured during the month of manufacture.

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CONSTANT SPEED PROPELLER SYSTEM DESCRIPTION AND OPERATING PRINCIPLES

1. Reciprocating (Piston) Engine Propellers

- A. McCauley propellers for reciprocating engines are of two types: constant speed or constant speed feathering. Each type is provided in either a two-blade or three-blade configuration.
- (1) The C200 Series is a two-blade constant speed propeller. (Refer to Figure 1).
 - (2) The C300 Series is a two-blade constant speed feathering propeller. (Refer to Figure 2).
 - (3) The C400 Series is a three-blade constant speed propeller. (Refer to Figure 3).
 - (4) The C500 Series is a three-blade constant speed feathering propeller. (Refer to Figure 4).
- B. Each propeller consists of a hub assembly, propeller blades, piston and cylinder assembly.
- C. Description of the Propeller Assembly and Deice Components:
- (1) Propeller Hub Assembly - The propeller hub is a single piece, hollow assembly with propeller blade sockets. Each blade socket to blade shank is O-ring sealed to prevent leakage. The rear hub face has threaded studs or bolts for attachment to the engine flange. Some engine flanges have dowels that mate with holes in the hub for alignment. These ensure proper mounting to the engine propeller shaft flange.
 - (2) Propeller Blades - The propeller blades are made of solid forged aluminum. Each is match-balanced to the other blades.
 - (a) The entire propeller assembly is static balanced as well, using balance weights mounted with screws to the blades or the cylinder balance ring.
 - (3) Blade Retention - A set of split retainers (inside the hub) secures each blade in the hub at the blade sockets. During pitch change, each blade rotates about its axis on a bearing assembly. An actuating pin assembly is secured to the blade butt of each blade (inside the hub) by screws. The actuating pin is driven by a link assembly attached to the piston yoke inside the hub cavity.
 - (4) Piston and Cylinder Assembly - Oil pressure, controlled by the propeller governor, and an internal spring act on the piston to provide the forces necessary to accomplish propeller blade pitch changes. The cylinder is mounted to the hub face with screws and is sealed to prevent leakage.
 - (5) Counterweight - Feathering type propellers have counterweights attached to the blades to assist the rotation of the blade to the feathered position.
 - (6) Internal Lubrication - On some models, grease is applied to the bearings for lubrication when the propeller is assembled. However, on other models the lubrication medium is oil. On oil-filled propellers, the hub cavity is partially filled with red dyed engine type oil which is sealed in the hub and isolated from engine oil. This oil provides lubrication and corrosion protection to blade bearings and other internal parts. The oil is dyed red to aid in the troubleshooting of suspected propeller leaks.

NOTE: Periodic field maintenance of this lubrication is NOT normally required.

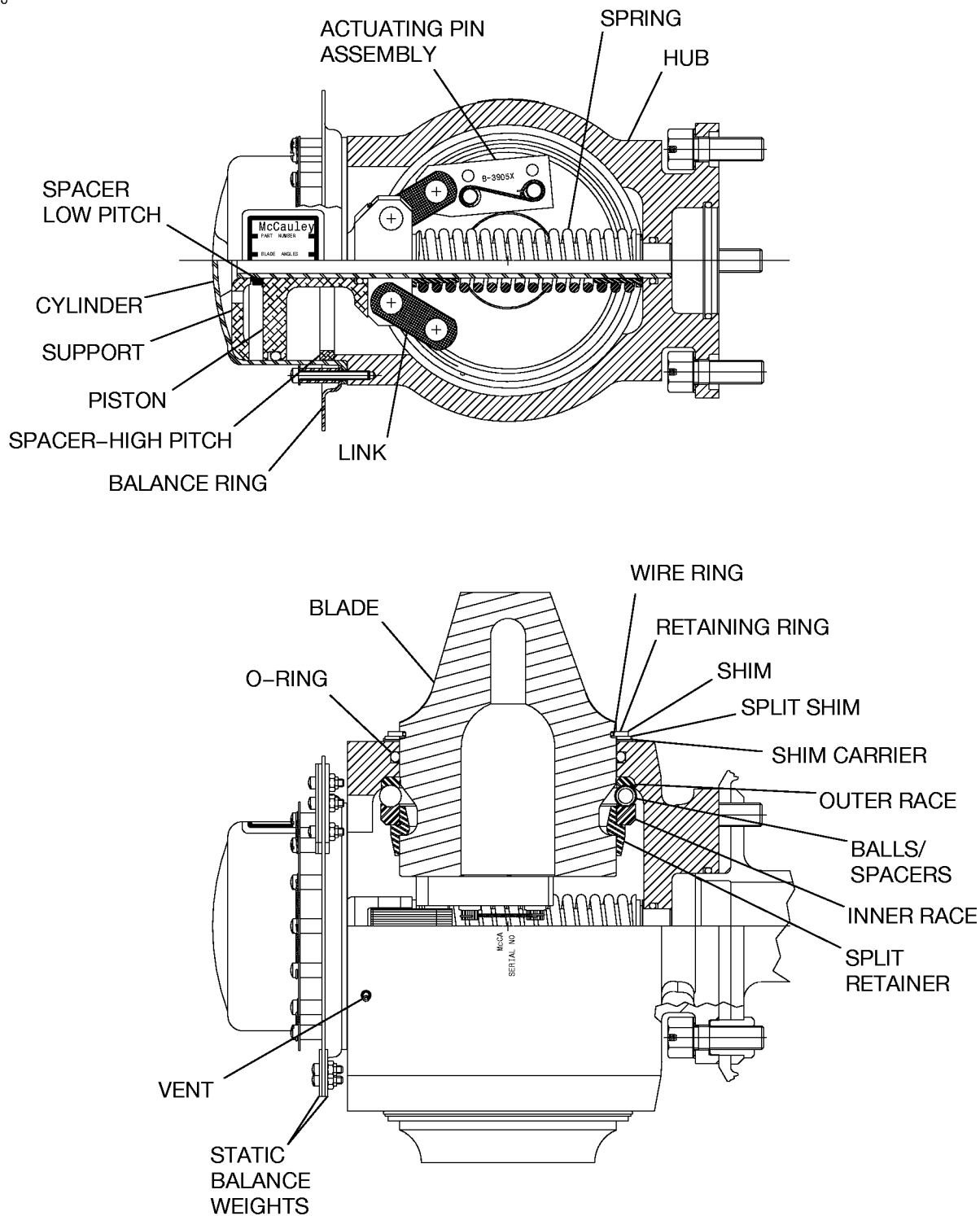
- D. Description of Piston Engine Propeller Operating Principles
- (1) The C200 and C400 series propellers are constant speed type. They are a single-acting unit in which hydraulic pressure works against the forces of springs and the natural centrifugal moment of the rotating blade to provide the correct pitch for engine load. Hydraulic pressure causes the blades to move toward high pitch (decreasing rpm). The springs and centrifugal moments urge blades toward low pitch (increasing rpm).
 - (2) The C300 and C500 series propellers are constant speed and full-feathering type. They are a single-acting unit in which hydraulic pressure works against the forces of springs and counterweights to provide the correct pitch for engine load. Hydraulic pressure causes the blades to move toward low pitch (increasing rpm). The springs and counterweights urge blades toward high pitch (decreasing rpm).
- E. Propeller Deice (Refer to Figure 11)

NOTE: Only components sold by McCauley are described. Some OEMs or STC owners may have different designs.

- (1) If propeller deice is installed, the components include:
 - electrically heated rubber boots

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C320



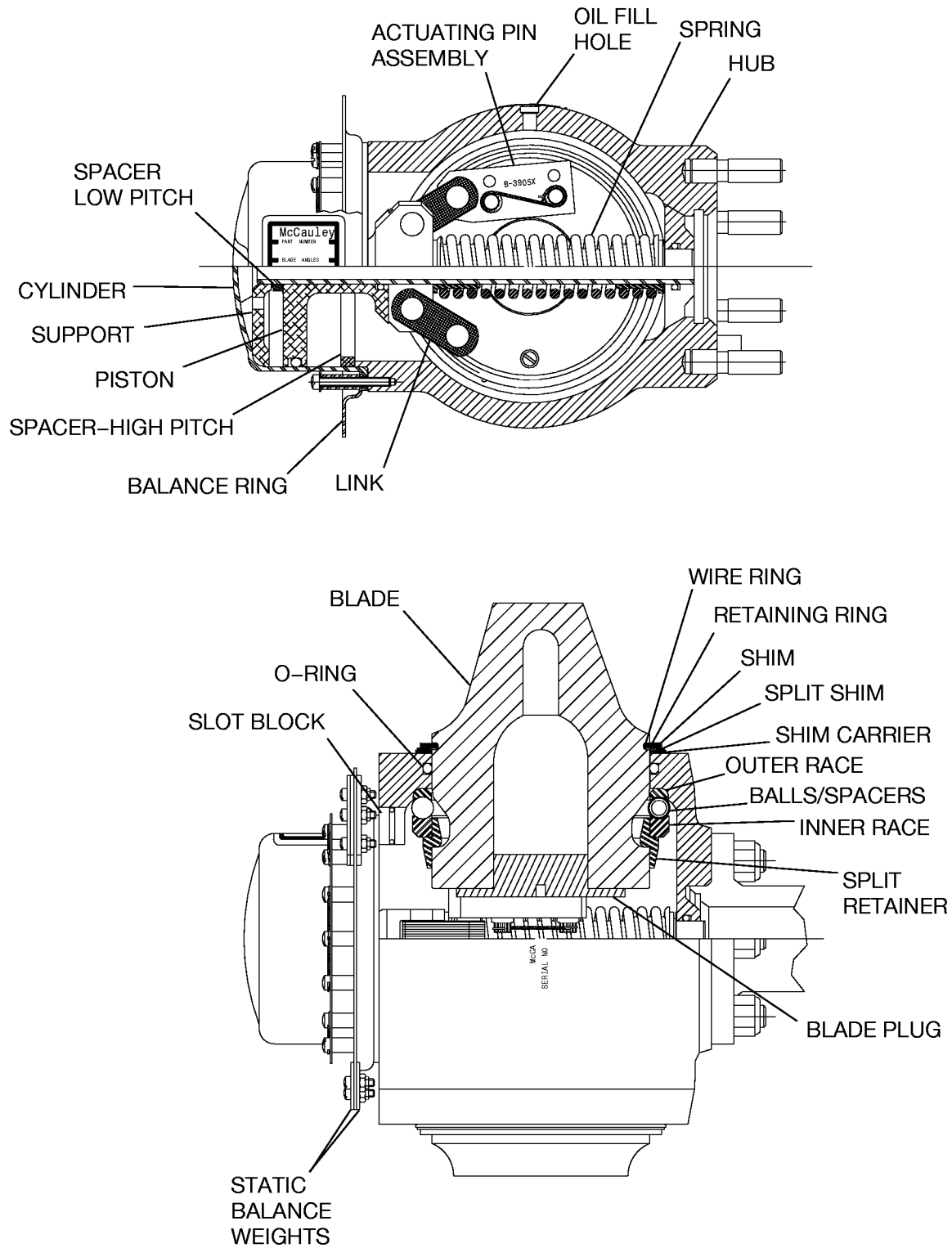
NON OIL FILLED

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C200 Series Propeller
 Figure 1 (Sheet 1)

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C336

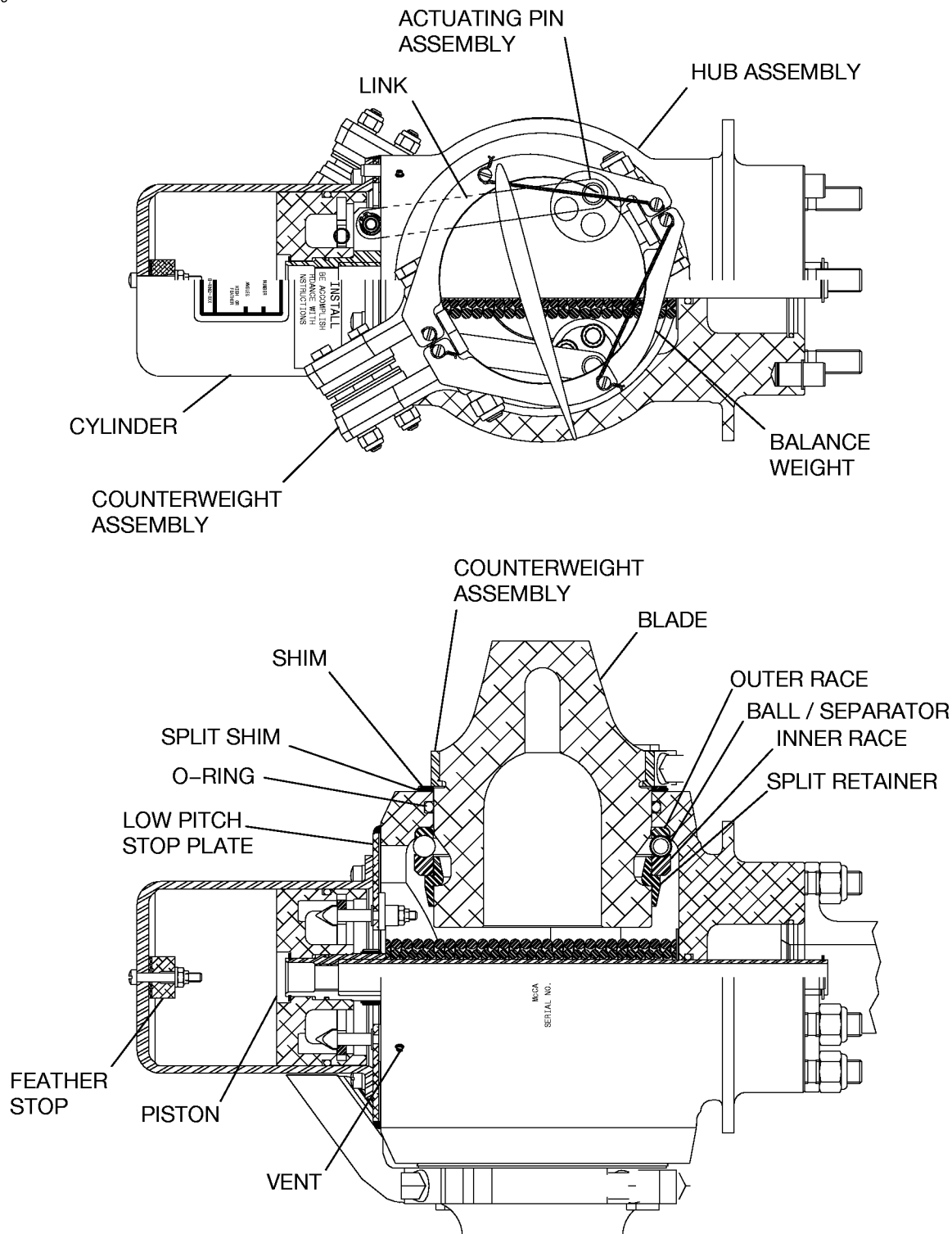


OIL FILLED

C200 Series Propeller
 Figure 1 (Sheet 2)

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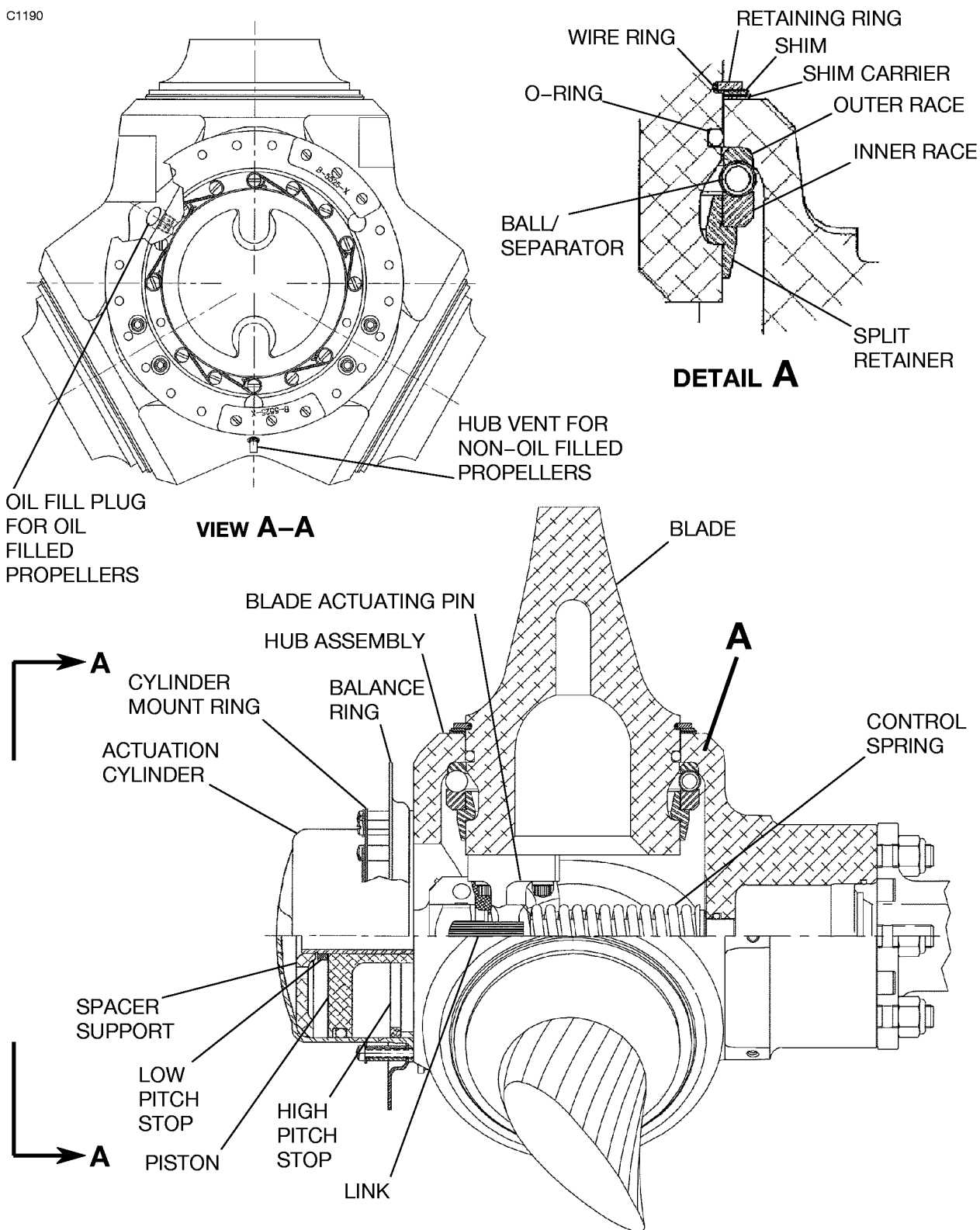


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C300 Series Propeller (Non Oil-Filled)
 Figure 2 (Sheet 1)

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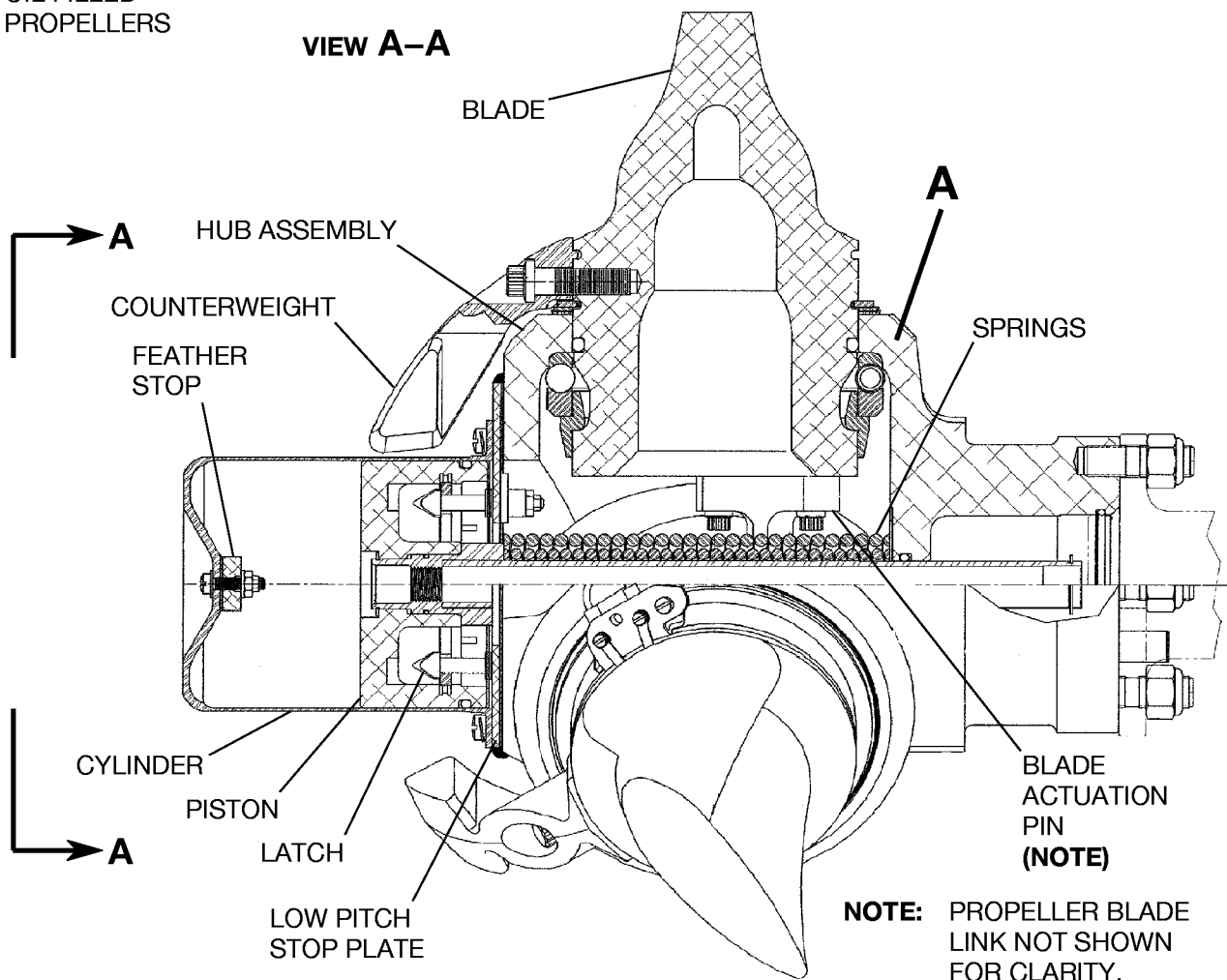
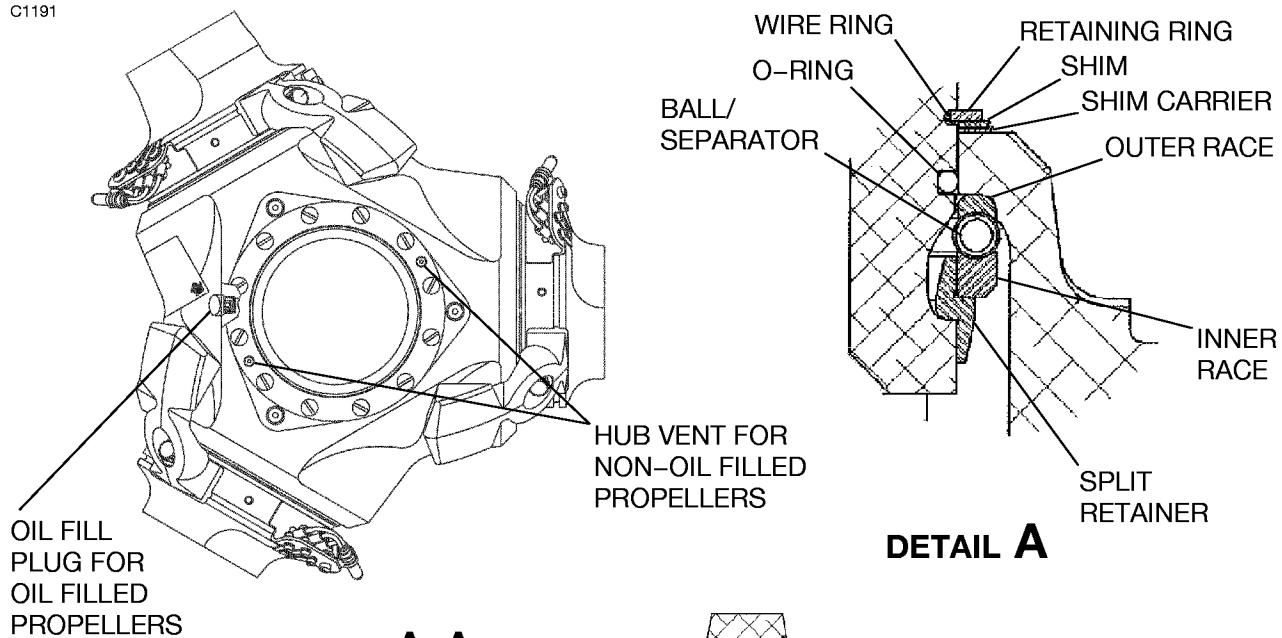
C1190



C400 Series Propeller
 Figure 3 (Sheet 1)

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C1191



C500 Series Propeller
 Figure 4 (Sheet 1)

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- deice harnesses
 - slip ring assembly
 - deice timer
 - brush block assembly
 - (a) The brush block, deice harnesses, and slip ring assembly conduct electrical power to the propeller blade deice boot elements which then heat.
 - (b) The heat melts a layer of the ice which allows the remaining ice to be removed from the propeller blades by centrifugal force.
- F. Propeller Anti-Ice (Refer to Figure 11)
- (1) If propeller alcohol anti-ice is installed, the components include:
 - slinger ring assembly
 - spray head assembly
 - propeller blade feed shoe
 - (a) The slinger ring distributes anti-ice fluid from the fluid reservoir to the spray head assembly for each propeller blade. Anti-ice fluid is pumped into the rotating slinger ring and the centrifugal force of the rotating slinger ring forces the anti-ice fluid to flow to the spray head assemblies.
 - (b) The spray head assembly transports the anti-ice fluid from the slinger ring to the propeller blade feed shoe. The spray head distributes the anti-ice fluid across the grooves that are imbedded in the propeller blade feed shoes.
 - (c) The propeller blade feed shoe is attached to the leading edge of each propeller blade. The feed shoes are made of rubber and have grooves to guide/feed anti-ice fluid (alcohol) along the leading edge of the rotating propeller by centrifugal force. The alcohol that is distributed on the feed shoe and adjacent blade surface prevents the formation of ice on the propeller blades.
- G. Propeller Deice Boots/Alcohol Anti-Ice Feed Shoes (if installed).
- (1) The deice boots are constructed of fabric-reinforced, abrasion-resistant rubber. Electrical deice boots have a wire mesh or foil element that heats as current is supplied to the boot. A deice timer controls the current cycle that is applied to individual blades or boot segments. Alcohol anti-ice feed shoes are ridged for distribution of alcohol. The outer surface that is exposed to the environment has a glossy finish, while the side that is bonded to the propeller has a dull, matte finish.
- H. Deice Harness (if deice is installed) - The deice electrical harnesses connect the deice boots to the slip ring assembly to complete the deice electrical circuit.
- I. Deice Slip Ring Assembly (if deice is installed) - The deice slip ring assembly is constructed of machined aluminum with bronze commutator rings bonded to one side. Studs to attach the deice leads for each blade are located on the propeller side of the platter. These are brazed to the commutator rings and pass through holes provided for that purpose. Slip ring assemblies may be secured to the hub, to the starter ring gear, or the alternator belt drive pulley.

2. Turbine Engine Propellers

- A. Turbine Engine Propeller Component Description
- (1) McCauley C600 model series propellers have three propeller blades, C650 model series propellers have four propeller blades, C1100 model series propellers have five propeller blades. Each propeller consists of a hub assembly, propeller blades, piston and cylinder assembly, blade start locks, counterweights, a spinner, and spinner bulkhead assembly. (Refer to Figure 5, Figure 6 and Figure 10.)
 - (a) The McCauley C600, C650, and C1100 model series propellers are used on Honeywell (Garrett) turbine engines.
 - (2) McCauley C700 model series propellers have three propeller blades, C750 model series propellers have four propeller blades, C1000 model series propellers have five propeller blades. Each propeller consists of a hub assembly, propeller blades, piston and cylinder assembly, counterweights and beta shift mechanisms. (Refer to Figure 7, Figure 8 and Figure 9.)
 - (a) The McCauley C700, C750 and C1000 model series propellers are used on Pratt and Whitney turbine engines.

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(3) Following is a breakdown of each of the propeller assemblies:

(a) Propeller Hub Assembly

1 The propeller hub is a single-piece hollow forged aluminum assembly incorporating three, four or five propeller blade sockets. The propeller blade sockets are O-ring sealed to prevent leakage. The rear hub face has threaded studs and dowel holes for alignment and proper mounting to the engine propeller shaft flange. The cylinder is mounted to the hub face using screws and is O-ring sealed to prevent leakage.

(b) Propeller Blades

1 The propeller blades are made of solid forged aluminum. A set of steel split retainers (inside the hub) secures each blade in the hub at the propeller blade sockets. Each blade rotates about its axis on a bearing assembly during pitch change and is match-balanced to the other blades. The propeller assembly is static balanced, using balance weights mounted with screws to the blades.

(c) Piston and Cylinder Assembly

1 The piston and cylinder assembly (through the feather springs, counterweights, and oil pressure transferred through the piston rod) provide the forces necessary to accomplish propeller blade pitch changes.

(d) Counterweights

1 Counterweights are attached to the blades to assist the feathering spring (located in front of the piston and cylinder assembly) in feathering the propeller blades by means of centrifugal force whenever the propeller is rotating and oil pressure in the cylinder is removed.

(e) Internal Lubrication

1 The propeller hub cavity is partially filled with turbine oil which is sealed in the hub and isolated from engine oil. This oil provides lubrication and corrosion protection to blade bearings and other internal parts. The oil is dyed red on some models to aid in the troubleshooting of suspected propeller leaks.

NOTE: Periodic maintenance of the lubrication is NOT normally required.

(f) Propeller Start Lock (C600, C650, and C1100 Series only).

1 The propeller has a start lock mechanism installed within the cylinder. The mechanism includes latching weights which will engage a fixed stop to block movement of the piston in the direction of increasing blade pitch beyond a predetermined start lock blade angle. Latch engagement is possible only when the engine is shut off on the ground. When the propeller is rotating, the latch weights move out by centrifugal force so as to offer no interference to operation of the control system in flight. During all normal operating conditions, the weights are in a disengaged position and offer no resistance to feathering, unfeathering, or reversing of the propeller.

NOTE: Special tools (McCauley part number B-5021/2) are required to release start locks manually for maintenance purposes.

B. Description of Turbine Propeller Operating Principles

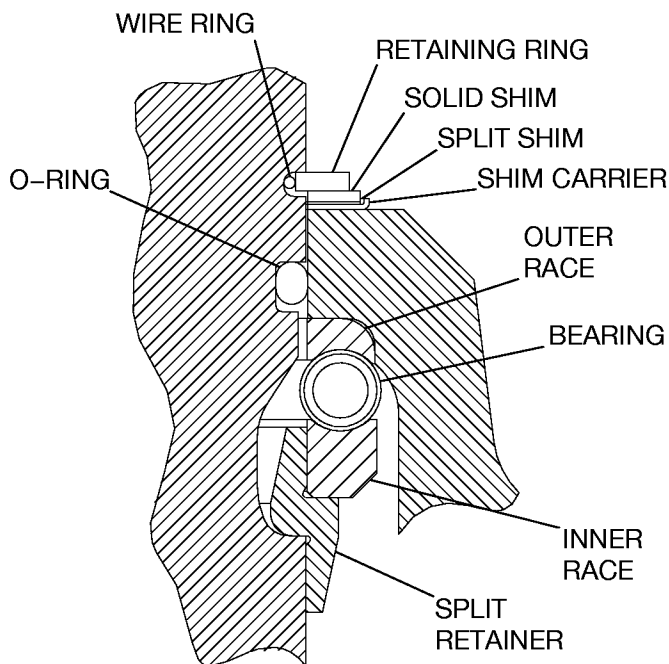
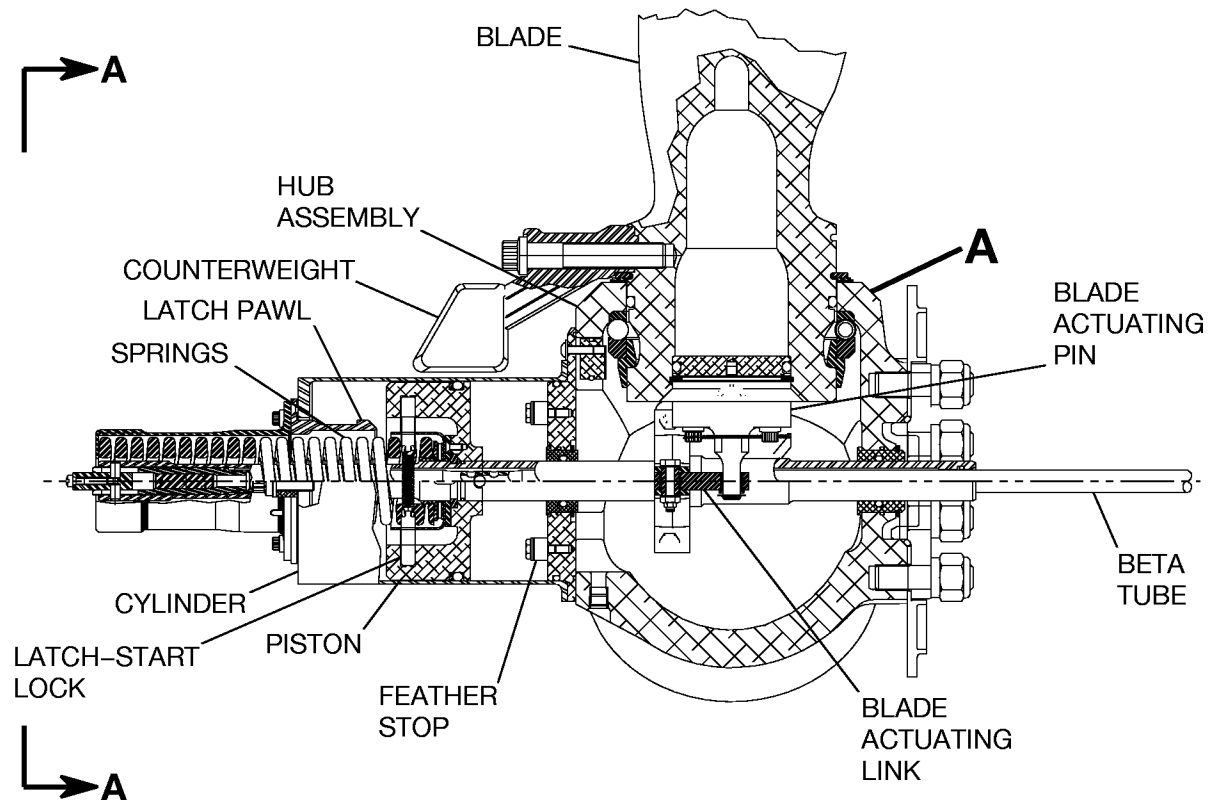
(1) Propellers are a single acting unit in which hydraulic pressure opposes the forces of springs and counterweights to obtain the correct pitch for engine load. Hydraulic pressure urges blades toward low pitch (increasing RPM), while springs and counterweights urge blades toward high pitch (decreasing RPM).

C. The propeller is designed to operate in two modes of operation - beta mode and governor mode:

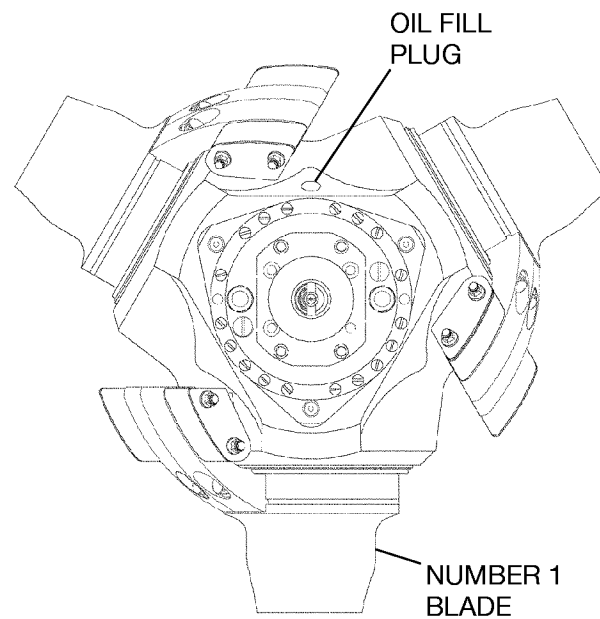
- (1) Governor Mode - Oil is metered to and from the propeller (by governor control valve as positioned by flyweights), increasing and decreasing blade angle (changing pitch) as required when the propeller speed control setting is altered, or increasing and decreasing pitch to control and stabilize engine speed with varying power conditions or flight attitudes with a fixed speed setting.
- (2) Beta Mode - The pilot may select beta mode for ground reversing or taxi operation by means of the aircraft engine mechanical linkage. The linkage repositions the propeller reversing lever and beta valve to provide access for high pressure oil to reach the propeller piston and move the blades toward reverse pitch.

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DETAIL A



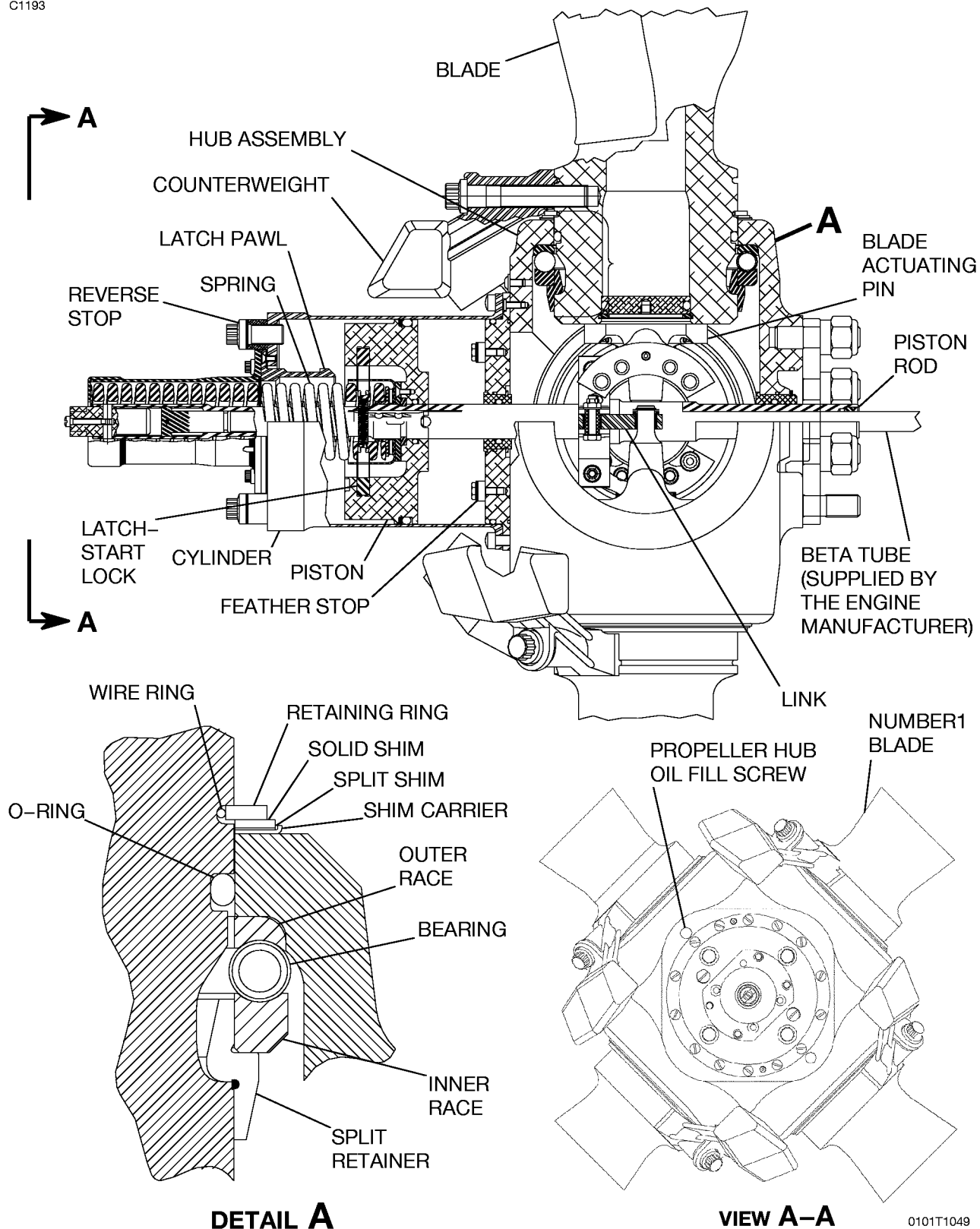
VIEW A-A

0101T1050

C600 Series Propeller
 Figure 5 (Sheet 1)

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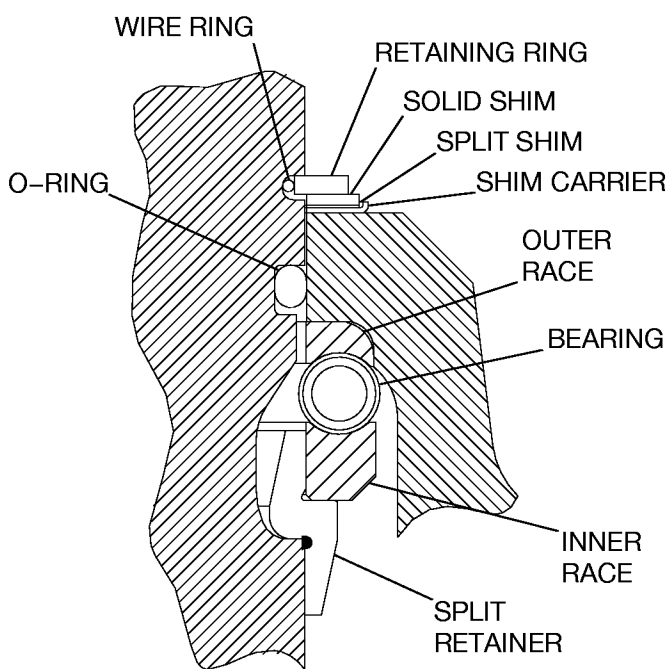
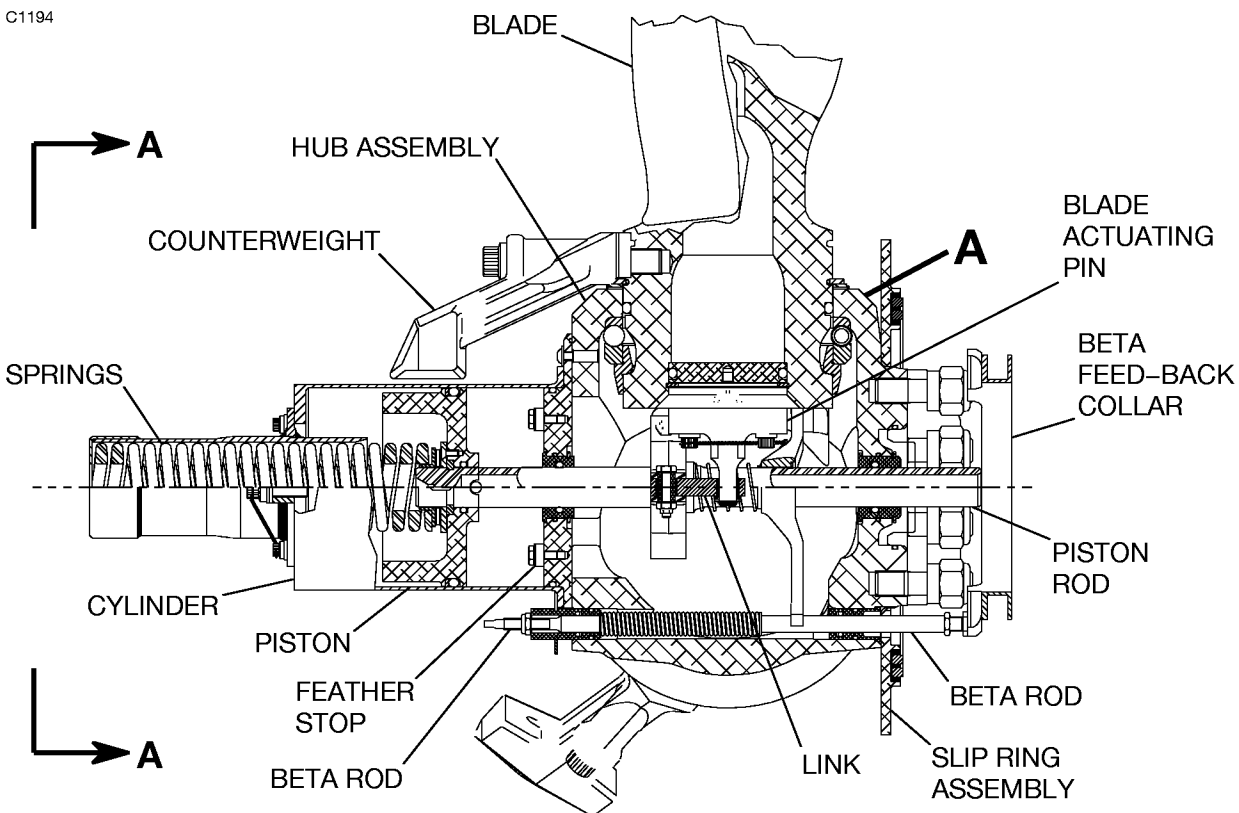


0101T1049

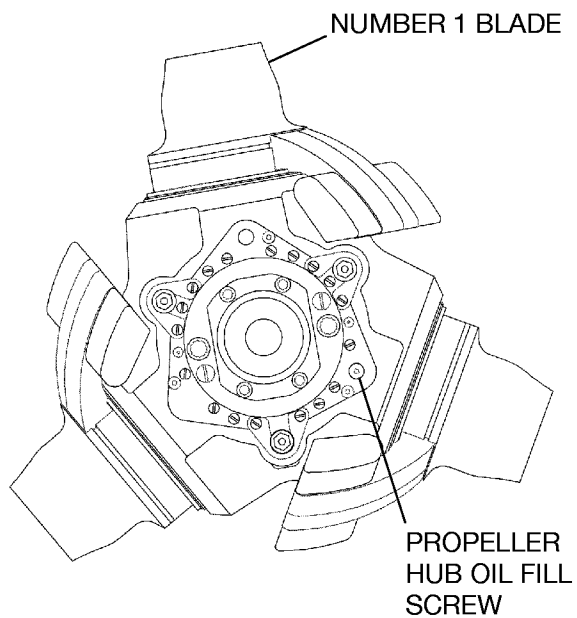
C650 Series Propeller
 Figure 6 (Sheet 1)

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C1194



DETAIL A



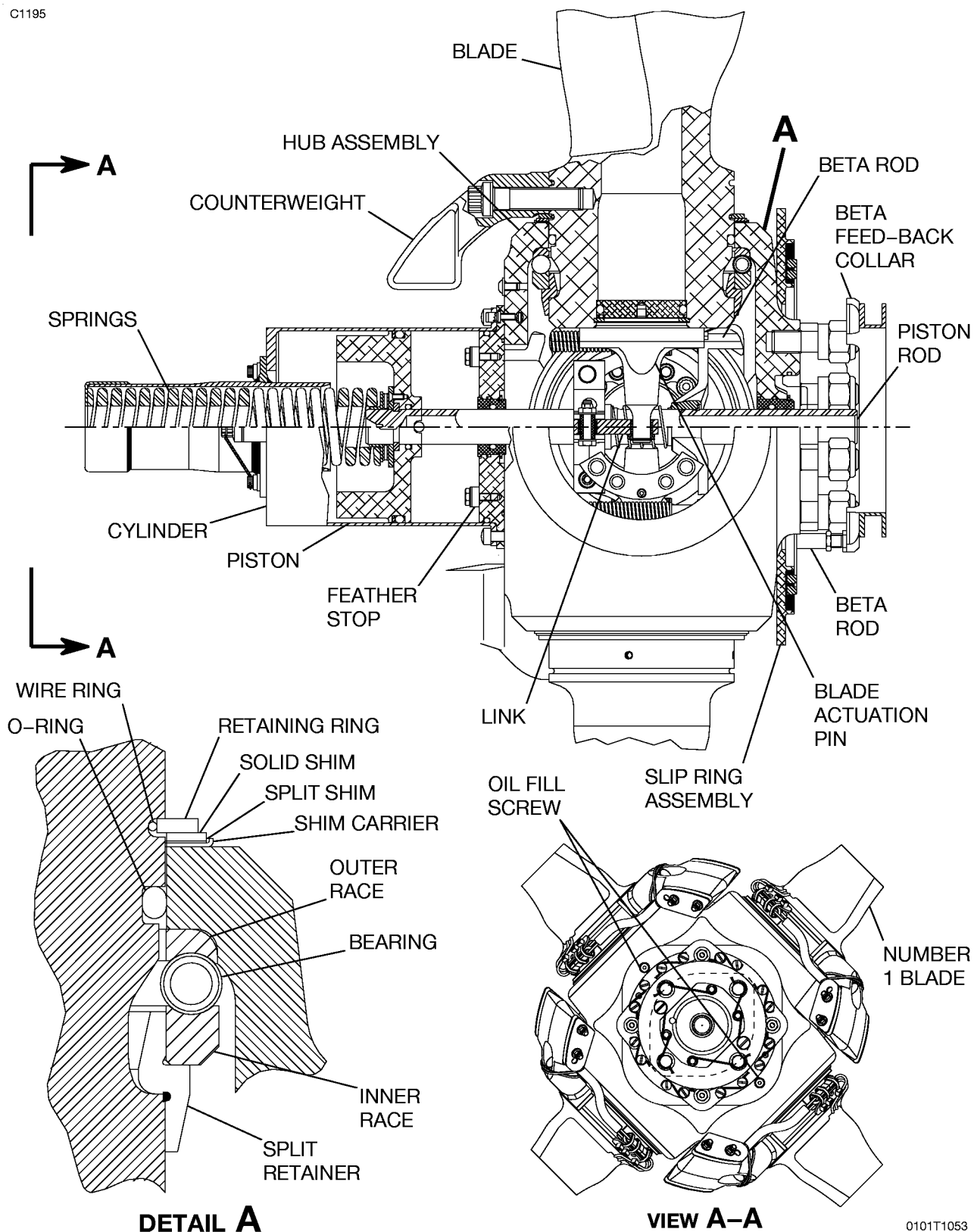
VIEW A-A

0101T1051

C700 Series Propeller
 Figure 7 (Sheet 1)

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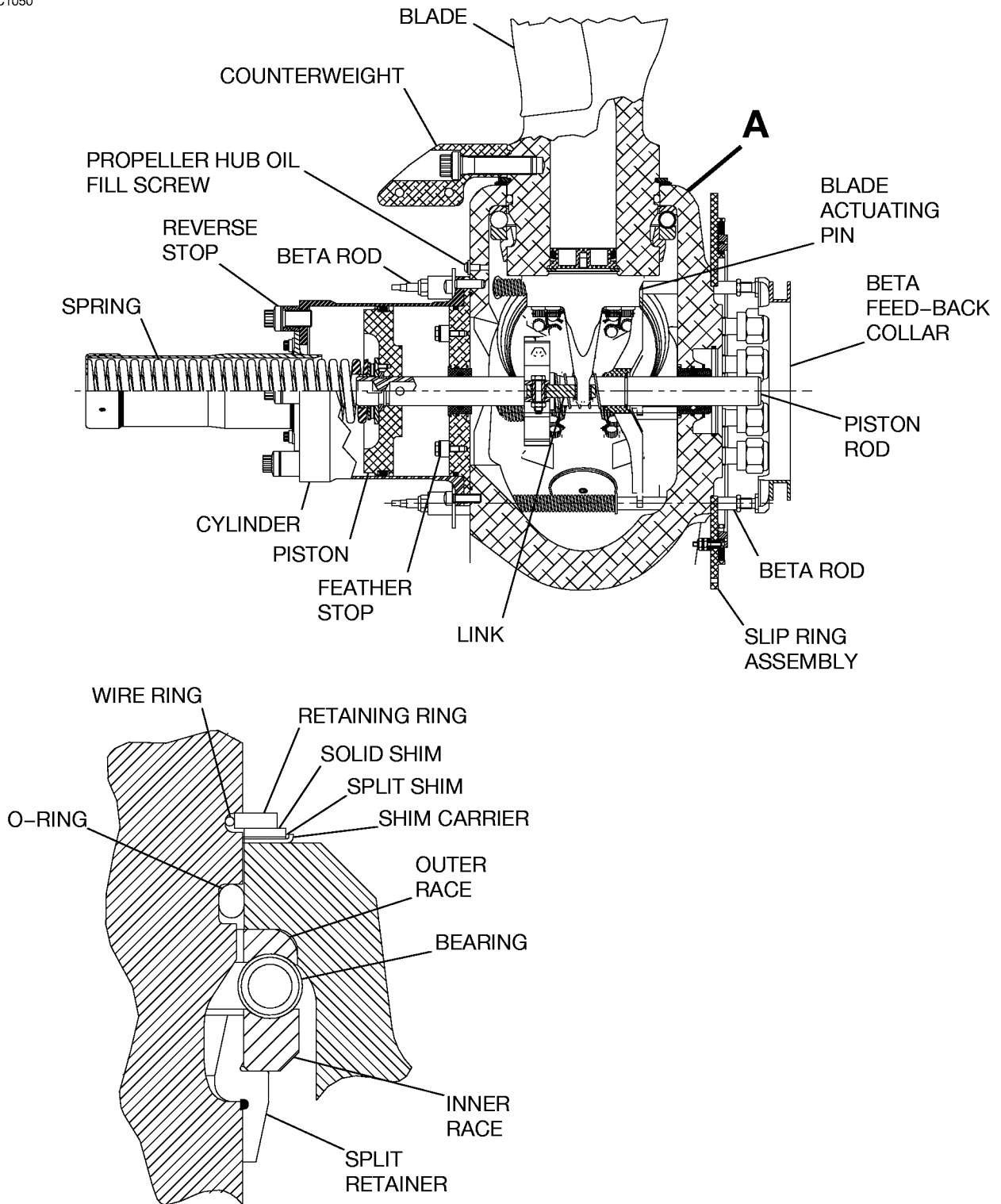


C750 Series Propeller
 Figure 8 (Sheet 1)

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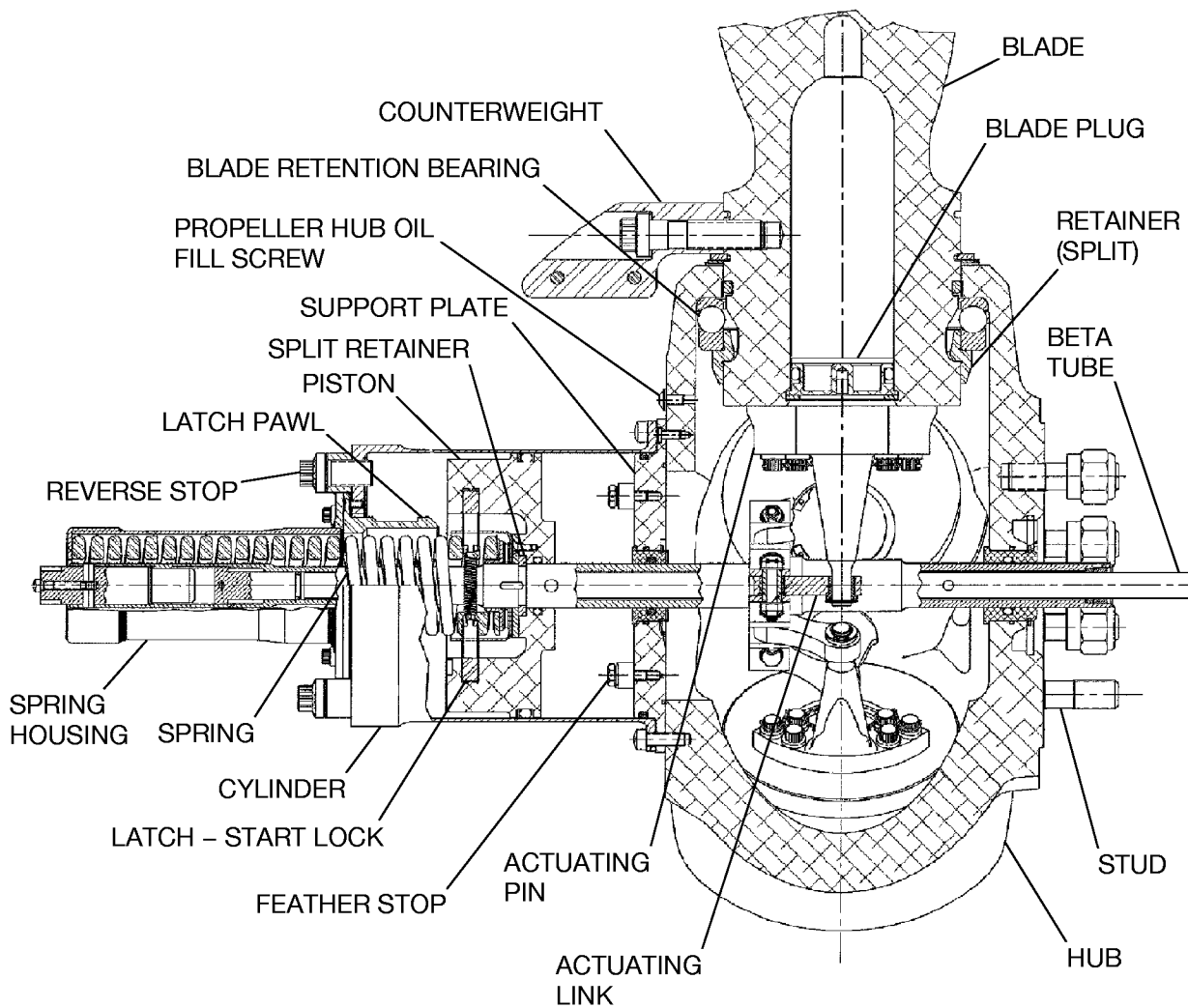
DETAIL A

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C1000 Series Propeller
 Figure 9 (Sheet 1)

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C1196



PROPELLER SECTIONAL DRAWING
C1105

NOTE: THE OIL FLOW (BETA) TUBE IS FURNISHED BY ENGINE MANUFACTURER.

C1100 Series Propeller
Figure 10 (Sheet 1)

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D. Propeller Deice, refer to Figure 11.

NOTE: Only components sold by McCauley are described. Some OEMs or STC owners may have different designs.

- (1) If propeller deice is installed, the components include:
 - electrically heated rubber boots
 - deice harnesses
 - slip ring assembly
 - deice timer
 - brush block assembly
- (a) The brush block, deice harnesses, and slip ring assembly conduct electrical power to the propeller blade deice boot elements which then heat.
- (b) The heat melts a layer of the ice which allows the remaining ice to be removed from the propeller blades by centrifugal force.
- (c) Deice Harness (if deice is installed) - The deice electrical harnesses connect the deice boots to the slip ring assembly to complete the deice electrical circuit.
- (d) Deice Slip Ring Assembly (if deice is installed) - The deice slip ring assembly is constructed of machined aluminum with bronze commutator rings bonded to one side. Studs to attach the deice leads for each blade are located on the propeller side of the platter. These are brazed to the commutator rings and pass through holes provided for that purpose. Slip ring assemblies are secured to the hub or are sandwiched between the hub and the engine flange.

3. Overhaul Period

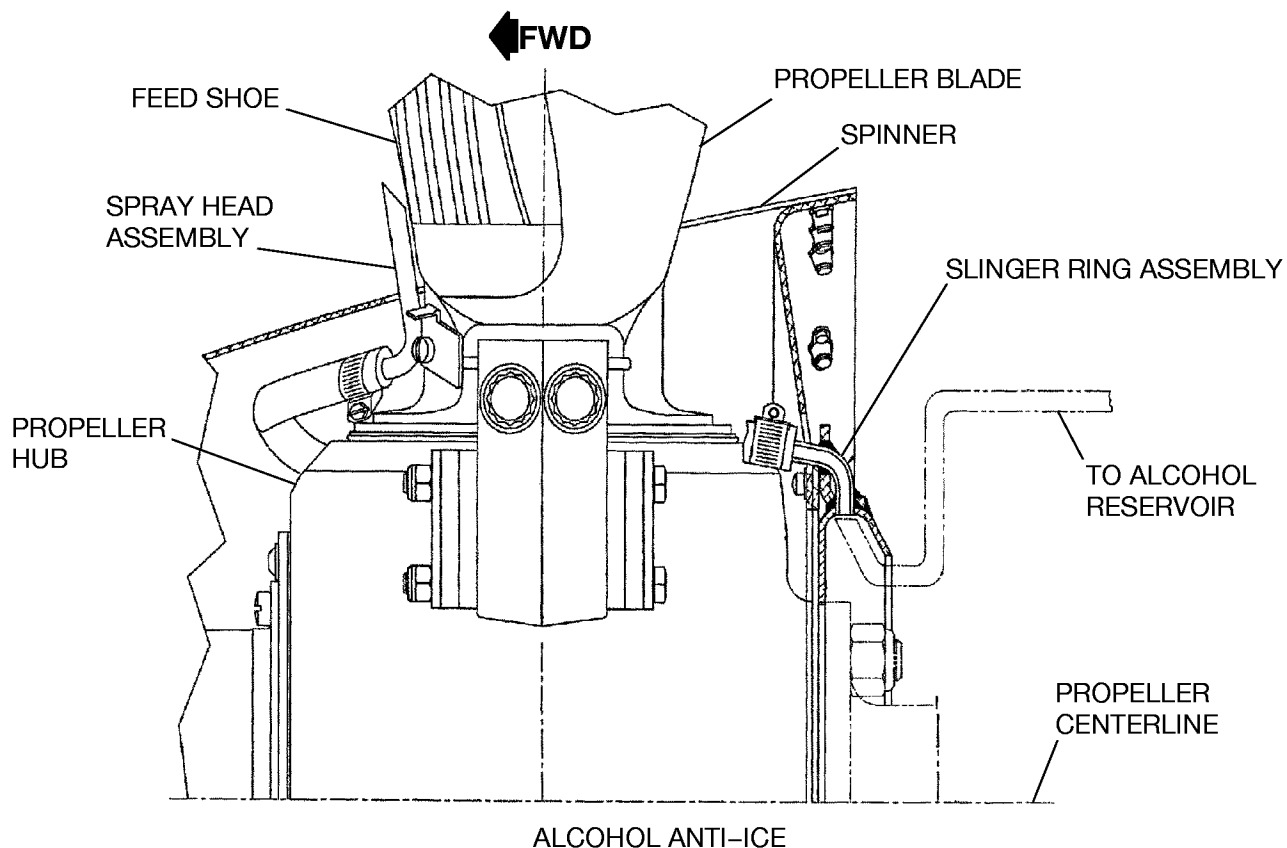
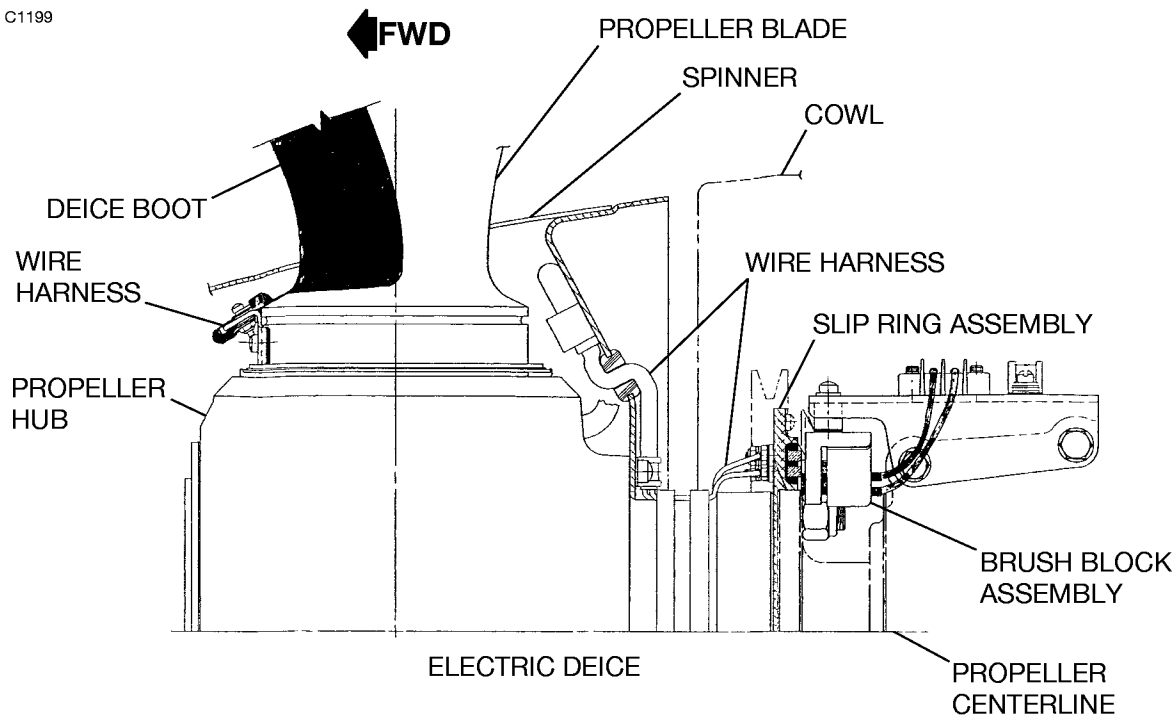
- A. All propellers are to be overhauled at specific intervals. Refer to Time Between Propeller Overhaul for required propeller overhaul intervals. Propellers shall also be overhauled or repaired as required for blade surface conditions.

4. Propeller Model Designation

- A. McCauley uses a model designation system to identify specific propellers. This is done by utilizing a combination of hub and blade model designations.
- B. Hub Model Designation.
 - (1) The hub model designation is steel stamped on the propeller hub. Examples of hub model designation:

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C1199

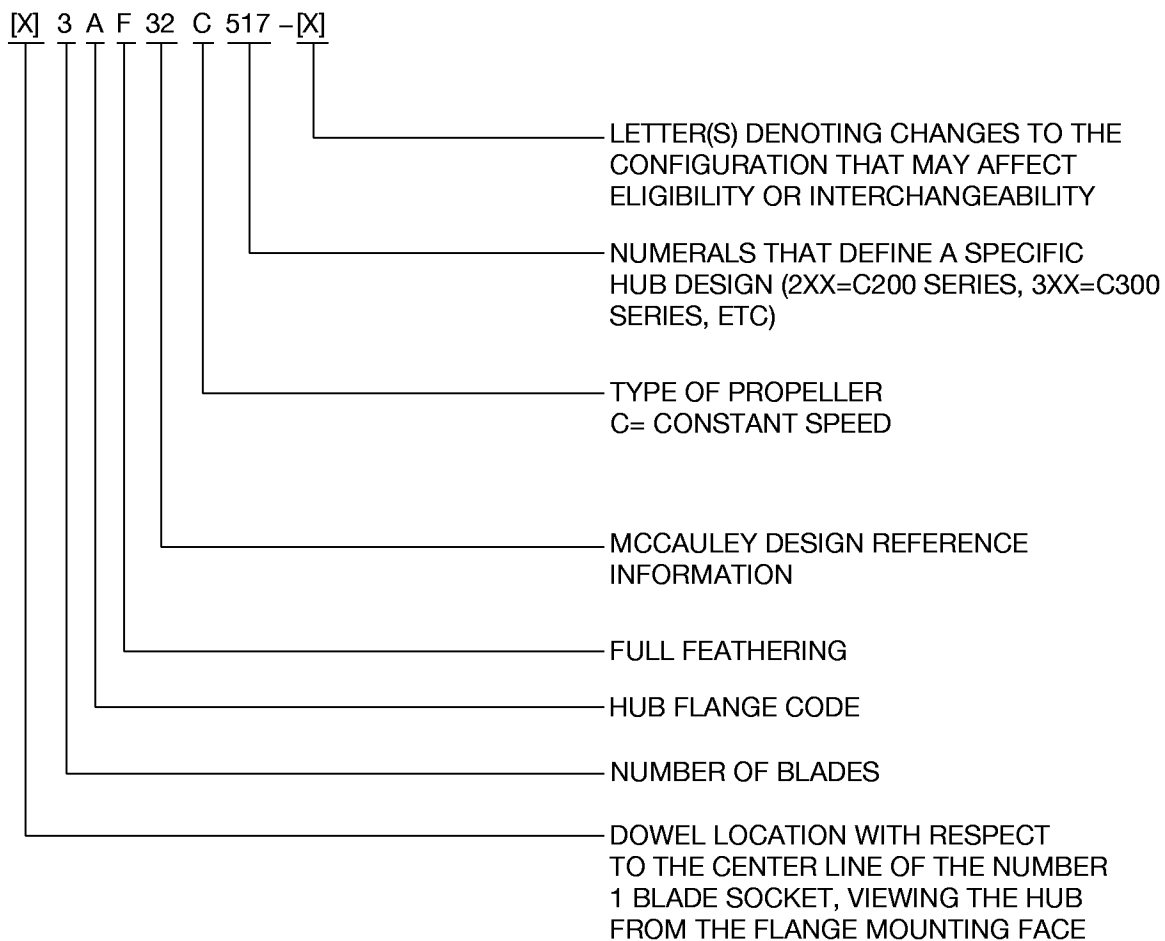


Propeller Deice/Anti-Ice Installation
 Figure 11 (Sheet 1)

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C1030

[X]3AF32C517-[X]- SAMPLE PISTON ENGINE HUB MODEL DESIGNATION

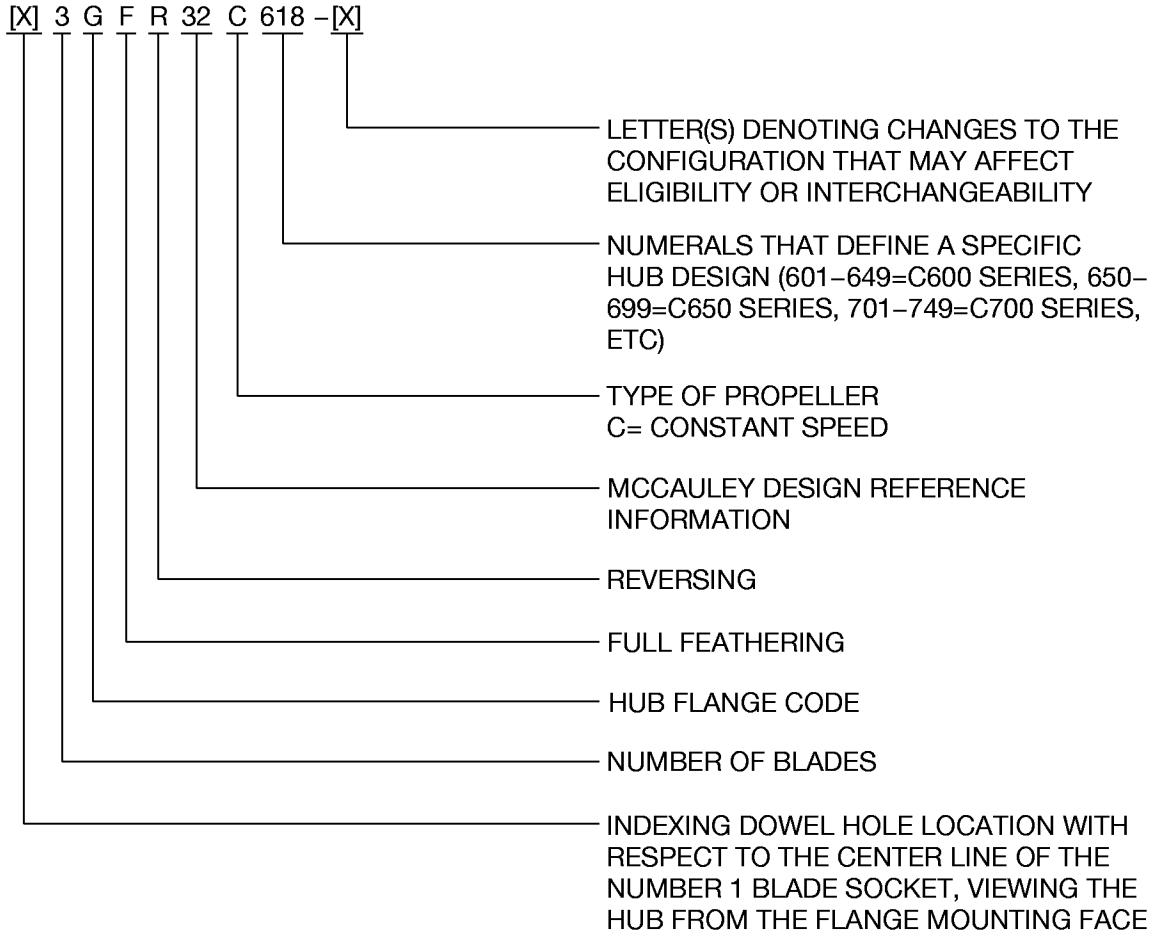


NOTE: A SPECIFIC PROPELLER ASSEMBLY IS IDENTIFIED BY THE HUB SERIAL NUMBER WHICH IS STAMPED ON THE HUB. ALL RECORDS OF PROPELLER COMPONENTS ARE KEPT WITH REFERENCE TO HUB SERIAL NUMBER. THE FIRST TWO DIGITS OF THE HUB SERIAL ARE THE YEAR OF MANUFACTURE. THE REMAINING DIGITS ARE THE NUMBER OF THE HUB MANUFACTURED IN THAT YEAR.

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C1031

[X]3GFR32C618-[X]– SAMPLE TURBOPROP HUB MODEL DESIGNATION



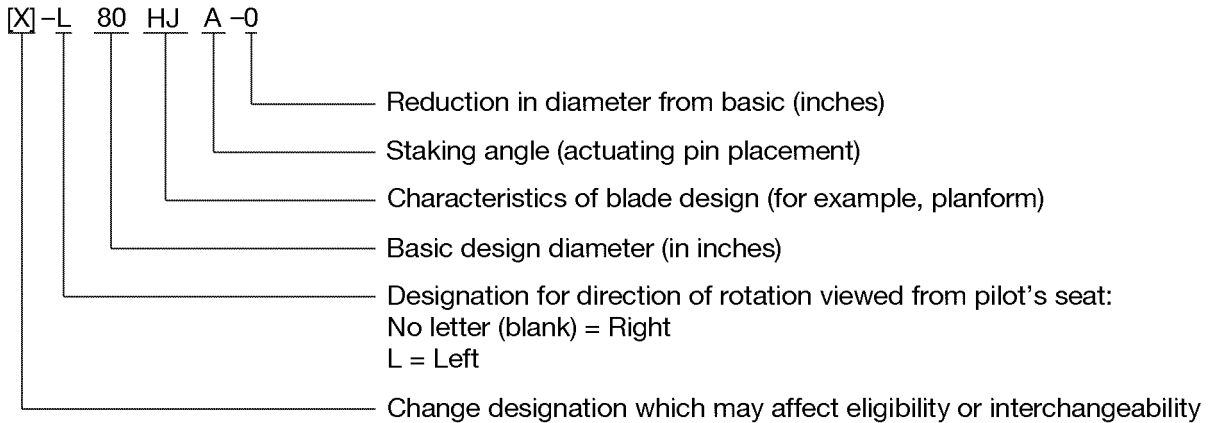
NOTE: A SPECIFIC PROPELLER ASSEMBLY IS IDENTIFIED BY THE HUB SERIAL NUMBER WHICH IS STAMPED ON THE HUB. ALL RECORDS OF PROPELLER COMPONENTS ARE KEPT WITH REFERENCE TO HUB SERIAL NUMBER. THE FIRST TWO DIGITS OF THE HUB SERIAL ARE THE YEAR OF MANUFACTURE. THE REMAINING DIGITS ARE THE NUMBER OF THE HUB MANUFACTURED IN THAT YEAR.

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C. Blade Model Designation

- (1) All blades are impression stamped on the butt end with blade model designation, propeller type certificate number, and blade serial number. This stamping is not visible from the outside of the propeller assembly. The following is an example of blade model designation:

C1130



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PROPELLER TROUBLESHOOTING

1. General Information

A. Types of Problems Normally Encountered

- (1) This section outlines and explains a number of operating characteristics which have been observed in service. There is some discussion of propeller design as it relates to these characteristics. Procedures for locating and correcting causes of undesirable operation are given.

2. Operation in Restricted Power or RPM Conditions (Turbine)

A. There are several risks to the propeller blades and or hubs if the propeller is operated in restricted areas.

- (1) Each propeller is subjected to rigorous vibration tests to determine that the conditions under which a particular propeller/engine/airframe combination will operate safely. Certain power settings or RPM ranges are restricted by either the airframe manufacturer and/or McCauley. This is because vibrations produced in the restricted ranges can cause fatigue cracks in the hub or blades. Such cracks could cause catastrophic failures of the propeller and a subsequent crash of the aircraft.

B. Always carefully obey the restrictions published in the aircraft AFM/POH or the POH supplement provided with the STC under which the propeller is installed.

CAUTION: Failure to follow the published limitations for any McCauley propeller, could result in a reduced life or possibly even catastrophic loss of the propeller and/or aircraft.

C. If you are aware that a McCauley propeller has been operated outside the published limitations or in a restricted area, immediately call McCauley Product Support for assistance.

3. Propeller RPM Fluctuations (Constant Speed Piston, Turbine)

A. Symptoms:

- (1) Hunting is a cyclic or constant variation of engine speed, above and below that desired. It will be shown by constant wavering of the tachometer reading.
- (2) Surging is a wide or excessive increase or decrease in engine speed followed by return to the established speed after one or more oscillations.
- (3) Surging will occur and should be considered normal if lever/throttle is moved rapidly.

B. Possible Causes:

- (1) Hunting is seldom, if ever, caused by the propeller itself. Those conditions reported primarily have been caused by other parts of the system such as governor, fuel control, etc.
 - (a) For piston engine installations, the propeller can be tested in flight by reducing the manifold pressure. The propeller control should be in the full RPM position and the manifold pressure should be reduced until the RPM drops slightly. This ensures that the propeller is against its low pitch stop and is eliminated from the equation.
- (2) Surging may be caused by air in the propeller control hydraulic system, governor not operating correctly, or problems associated with the engine transfer bearing or collar.
- (3) If the governor test is satisfactory and no other system faults can be found, the propeller may be at fault. Although very rare, hunting and surging may be due to excessive internal pressure in the propeller or overshimming of the propeller blades.

C. Corrective Action:

- (1) If the propeller is suspected as the cause, it should be removed for examination by a McCauley authorized service facility.
- (2) Surging has been encountered on ground operation after initial installation while purging air from the system.
 - (a) If encountered at other times, the propeller should be cycled repeatedly to remove all air from the system.

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- (b) If the condition persists, it may be attributable to the governor, and the governor should be removed and tested. The propeller should be purged of air again after the governor is reinstalled.

4. Changing RPM or Creeping (Constant Speed Piston, Turbine)

- A. Propeller RPM changing and holding new setting.
 - (1) Possible Cause:
 - (a) Excessive "play" in the linkage between the governor and the cockpit control often leads to erratic operation.
 - (b) (Constant speed piston only) Possible excessive engine compartment heat affecting the governor plastic top cover.
 - (2) Corrective Action:
 - (a) Trace linkage, locate unsecured sections, and tighten as needed.
 - (b) Please note that although linkage may appear to allow full governor control while the engine is off, it may not in the air. Engine vibration and "stretch" of the mount during operation can often aggravate the condition. Therefore, it is important the entire length of linkage be properly secured.
 - (c) (Constant speed piston only) If heat has distorted the plastic top cover, replace it with an aluminum top cover.
- B. Once speed control and power settings are established for a flight attitude (cruise) and then the attitude is altered (to climb) without change of speed and power settings, the engine speed may change slightly.
 - (1) Possible Causes:
 - (a) This effect is commonly known as "creeping" of the speed setting. It is a natural result and comes about in the following manner. When speed and power settings are established, the governor control valve will be opened an amount to provide a pressure which balances the propeller counterweight forces and spring load, and an oil flow which is determined by the leakage through the propeller pitch control bearing at that pressure. This will maintain the blade angle such that set power may be absorbed at the desired speed.
 - (b) If the attitude of the aircraft is altered and the airspeed changes, the blade angle will change to absorb the power at this airspeed. This change in blade angle will cause the forces to vary and consequently will change the control pressure and the propeller pitch control bearing leakage rate.
 - (c) Since the governor had been adjusted by the speed control for the first set of conditions, the effect will be to change the effective equilibrium speed of the propeller with no change in governor setting. The amount of change varies with engine transfer bearing clearance.
 - (d) This speed change is generally a negligible amount and is not cause for concern since it is a normal reaction of the control system.
 - (e) Control-friction lock in the aircraft is faulty.
 - (2) Corrective Action:
 - (a) If it is desired that the original speed setting be maintained in the new flight attitude, it may be necessary to alter the propeller control lever as required after the aircraft is trimmed out.
1 Refer to the aircraft maintenance manual.

5. Improper Propeller Static RPM (Piston)

- A. Incorrect propeller speed at a given power and static RPM setting.
 - (1) Possible Cause:
 - (a) If maximum static RPM is incorrect, the problem can normally be attributed to either incorrect low blade angle or insufficient engine horsepower. However, if the maximum in-flight RPM is incorrect, then an adjustment of the governor may be necessary.

NOTE: On static runs, the propeller should prevent the engine RPM from going to red line. This is done to prevent overspeeding and is a design characteristic of the propeller. However, it should be within 100 RPM of red line.

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- (2) Corrective Action:
 - (a) One area that is often at fault for indicated RPM problems is the tachometer. Aviation tachometers can be inaccurate, so begin troubleshooting by verifying the accuracy of the tachometer.
 - (b) Verify the propeller low blade angles are correct. This is most effectively accomplished at a McCauley authorized propeller repair facility. This is done by measuring the blade angle at the reference station (generally the 30 inch (762 mm) station) and comparing the angles to those listed in either the type certificate of the airframe manufacturer or the STC under which the propeller was installed. If the angles are correct, then the engine is not producing the proper horsepower needed to make the rated static RPM.
 - (c) Begin troubleshooting the engine.

6. Improper Propeller Maximum RPM in Flight (Constant Speed Piston)

- A. Incorrect propeller speed with maximum RPM selected in flight.
 - (1) Possible Cause:
 - (a) Inaccurate tachometer reading.
 - (b) Linkage is out of rig.
 - (c) Governor stop screw requires adjustment.
 - (2) Corrective Action:
 - (a) Repair or replace the tachometer.
 - (b) Governor stop screw requires adjustment.
 - 1 Do a test flight.
 - 2 Pull the propeller control back until it reaches redline RPM.
 - 3 Allow the RPM to stabilize.
 - 4 Land the aircraft without touching the propeller control lever.
 - 5 Adjust the propeller stop screw to the propeller control location.
 - 6 Rig the aircraft power controls in accordance with the instructions of the manufacturer.
 - 7 Do another flight test to verify the correct setting.

7. Propeller Fails to Control

- A. (Constant speed, non-feathering only) Propeller goes to low pitch (high RPM) of its own accord.
 - (1) Possible Cause:
 - (a) Governor linkage disconnected.
 - 1 Corrective Action:
 - a Check and repair governor linkage.
 - (b) Engine transfer bearing/collar oil leakage rate exceeds specification.
 - 1 Corrective Action:
 - a Check transfer bearing/collar oil leakage rate per the instructions of the engine manufacturer.
 - (c) Loss of engine oil pressure.
 - 1 Corrective action:
 - a Verify the engine oil pressure in accordance with the instructions of the engine manufacturer.
 - (d) Obstruction in the crankshaft.
 - 1 Correction action:
 - a Remove propeller and check for obstruction in the crankshaft oil gallery (ie. rags, shipping plugs, etc.).
 - (e) Internal governor problem.
 - 1 Corrective Action:
 - a Have the governor checked by an FAA approved Part 145 Propeller Repair Station or international equivalent.

NOTE: Failure of an internal governor part may result in metal contamination in the engine oil lubrication system. If internal governor failure is confirmed, the engine and propeller should be checked for metal contamination in accordance with the specifications of the engine manufacturer.

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- B. (Feathering propeller) The propeller goes to high pitch or feathers of its own accord. This may occur without warning from otherwise normal operation and may or may not be accompanied by noticeable external oil leakage.

(1) Possible Cause:

- (a) Incorrectly adjusted governor.
 - 1 Corrective Action:
 - a Have the governor checked by an FAA approved Part 145 Propeller Repair Station or international equivalent.
- (b) Incorrectly rigged governor.
 - 1 Corrective Action:
 - a Check governor control rigging in aircraft for proper operation.
- (c) Engine transfer bearing/collar oil leakage rate exceeds specification.
 - 1 Corrective Action:
 - a Check transfer bearing/collar oil leakage rate per the instructions of the engine manufacturer.
- (d) Loss of engine oil pressure.
 - 1 Corrective action:
 - a Verify the engine oil pressure in accordance with the instructions of the engine manufacturer.
- (e) Obstruction in crankshaft.
 - 1 Correction action:
 - a Remove propeller and check for obstruction in the crankshaft oil gallery (ie. Rags, shipping plugs, etc.).
- (f) Internal governor problem.
 - 1 Corrective Action:
 - a Have the governor checked by an FAA approved Part 145 Propeller Repair Station or international equivalent.

NOTE: Failure of an internal governor part may result in metal contamination in the engine oil lubrication system. If internal governor failure is confirmed, the engine and propeller should be checked for metal contamination in accordance with the specifications of the engine manufacturer.

- C. Extreme sluggishness, failure to respond to changes in RPM setting or failure to hold constant RPM with varying aircraft attitude.

(1) Possible Cause:

- (a) Obstruction in the engine crankshaft.
 - 1 Correction action:
 - a Remove propeller and check for obstruction in the crankshaft oil gallery (ie. Rags, shipping plugs, etc.).
- (b) Internal governor problem.
 - 1 Corrective Action:
 - a Have the governor checked by an FAA approved Part 145 Propeller Repair Station or international equivalent.

NOTE: Failure of an internal governor part may result in metal contamination in the engine oil lubrication system. If internal governor failure is confirmed, the engine and propeller should be checked for metal contamination in accordance with the specifications of the engine manufacturer.

- (c) Internal Propeller problem.
 - 1 Corrective action:
 - a Have the propeller checked by an FAA approved Part 145 Propeller Repair Station or international equivalent..

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- (d) Engine transfer bearing/collar oil leakage rate exceeds specification or rotated engine transfer bearing.
 - 1 Corrective Action:
 - a Check transfer bearing/collar condition and oil leakage rate per the instructions of the engine manufacturer.

8. Propeller Feathers at Shutdown (300, 500, 600, 650, and 1100 Model Series Only)

WARNING: Before starting an engine with a feathered propeller, engine manufacturer should be consulted.

CAUTION: Do not start the engine and do a run-up with the cockpit propeller control lever in the "feather" position. This results in latching mechanism failure.

- A. After engine shut down, the propeller may move slowly to the full-feathered position.
 - (1) Possible Cause:
 - (a) Damaged latch mechanisms, corrosion, dirt, or foreign matter in the mechanism causing latch weights to stick (may be evidenced by intermittent condition).
 - (b) Propeller control not set to maximum RPM at shutdown.
 - (2) Corrective Action:
 - (a) Repair of latching mechanism must be performed by an FAA approved Part 145 Propeller Repair Station or international equivalent.

9. Propeller Fails to Feather Properly

- A. Failure of the propeller to feather normally after the propeller control is moved to the feathering position.
 - (1) Possible Causes:
 - (a) Lack of feather response may be due to one of the following causes:
 - 1 Malfunction or incorrect rigging of control linkage.
 - 2 Misadjusted governor.
 - 3 High blade turning friction.
 - 4 Improperly installed deice system.
 - 5 Inoperative start lock latches.
 - (2) Corrective Action
 - (a) Check all propeller control rigging for incorrect adjustment. Replace propeller governor with known working unit. If neither of these actions eliminates the problem, the propeller may be at fault. Remove propeller for examination at an FAA approved Part 145 Propeller Repair Station or international equivalent.

10. Vibration Troubleshooting

- A. Troubleshooting vibration problems can be very challenging and time consuming. Most digital dynamic equipment can also be used to track down vibration problems. The digital dynamic balancing equipment can display the amplitude and frequency of the vibration which will help determine the vibration source. While vibration problems are occasionally caused by the propeller, they are usually caused by other things. Below is a list of other possible sources of vibration:
 - (1) Engine
 - (2) Worn, old, cracked or loose engine mounts
 - (3) Cracked or loose engine mount structure
 - (4) Cracked or broken spinner bulkheads
 - (5) Loose or improperly mounted engine cowlings
 - (6) Loose cowl flaps
 - (7) Loose landing gear doors
 - (8) Out of balance elevators
 - (9) Loose control yokes
 - (10) Exhaust stack touching engine cowling
 - (11) Component in engine compartment that is touching engine cowling

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11. Unusual Aircraft Vibration

- A. Apparently excessive vibration felt during normal aircraft operation.

CAUTION: If a vibration starts suddenly and/or is accompanied by the leaking of red dyed oil from the propeller, determine the cause of the vibration and/or oil leakage before continuing propeller operation.

- (1) Possible Causes:
 - (a) If the propeller is believed to be the cause of the vibration, it is typically due to improper balance, blade track, or linkage problems within the propeller assembly.
 - (b) When a propeller is the cause of vibration, the aircraft typically vibrates throughout the entire RPM range although the intensity of the vibration may vary with the RPM. If a vibration occurs at only one RPM or within a limited RPM range, the vibration is not normally due to a propeller problem.
- (2) Corrective Action:
 - (a) If the propeller is suspected as the cause of the vibration, the following procedures should be performed:
 - 1 The ideal troubleshooting method is to temporarily replace the propeller with one that is known to be good and is the same model and test fly the aircraft. If the vibration is eliminated, the propeller is highly suspect and should be sent to an FAA approved Part 145 Propeller Repair Station or international equivalent for evaluation.
 - 2 If a replacement propeller is unavailable, check the following.
 - a Propeller imbalance can be the cause of vibration. Perform a dynamic balance on the suspect propeller to determine balance of the propeller. If the propeller cannot be successfully dynamically balanced, it should be removed and sent to an FAA approved Part 145 Propeller Repair Station or international equivalent for evaluation.
 - b Check the spinner for cracks at the bulkhead attach points for a cracked bulkhead or for a cracked front support.
 - c The propeller spinner can be a contributing factor to an out of balance condition. An indication of this would be a noticeable spinner "wobble" while the engine is running. This condition is normally caused by inadequate shimming of the spinner bulkhead or a cracked or deformed spinner. If a spinner is found to be "wobbling", it should be removed and reinstalled with the proper amount of shims as described in Fixed Pitch Propeller Removal and Installation, Constant Speed Reciprocating Engine Propeller Removal and Installation (Piston), C600/C650/C1100 Series Propeller Removal and Installation, or C700/C750/C1000 Propeller Removal/Installation. Any spinner found cracked must be replaced.
 - d Check amount of blade twist of each propeller blade when rotated within its socket as shown in Figure 101. Look for variations in the amount of movement of each blade in relation to the other blade(s).
 - e If excessive blade twist is found in one or more blades in relation to the others, the propeller could have an internal linkage problem. It should be removed and sent to an FAA approved Part 145 Propeller Repair Station or international equivalent for evaluation.
- (3) Possible Cause:
 - (a) Worn engine mounts.
- (4) Corrective Action:
 - (a) Consult the OEM or engine mount manufacturer manual for replacement criteria.

NOTE: The amount of total blade twist in each blade is, in itself, usually of no importance. It is a difference in the amount of blade twist from blade to blade that should be considered.

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12. Blade Shake

A. Symptom:

NOTE: "Blade Shake" is listed in the "Propeller Troubleshooting" section of this manual for informational purposes only as it has been misinterpreted in the past as a possible problem by some operators. Despite its appearance in this section, it should never be considered a cause for concern or propeller replacement.

- (1) Blade shake is the tendency for the blades to wobble slightly when the tip is physically moved by hand from the leading edge to the trailing edge (Refer to Figure 101).
- (a) Total maximum allowable movement up to 0.125 inch (3.13 mm) at the blade tip is considered normal.

B. Cause:

- (1) This tendency is the natural result of a tolerance buildup. A very small movement at the hub is magnified many times at the blade tip. It is NOT the source of vibration or any other problems. While the propeller is rotating, centrifugal force on the blades seats them rigidly and positively against the retention bearings in the hub.

C. Corrective Action:

- (1) No corrective action is required.

13. Oil or Grease Leaks

A. The presence of oil or grease on propeller blades may or may not indicate a problem.

- (1) Grease lubricated propellers may have grease deposits on the blade shank during the first 25 or 50 hours of operation after overhaul because the retaining bearings were packed with an excessive amount of grease.
- (2) All propeller blades may show minor grease streaking when new or newly overhauled. Such streaking is normal and is the result of lubricant applied to the blade O-ring during assembly.
- (3) Oil-filled propellers may show signs of oil deposited on the blade shank during operation after an overhaul or after a prolonged period of inactivity.

B. Checking and correcting a leaking propeller at the blade (C200 model series thru C1100 propeller model series only).

NOTE: This procedure will only correct blade shank leaks at the blade shank O-ring.

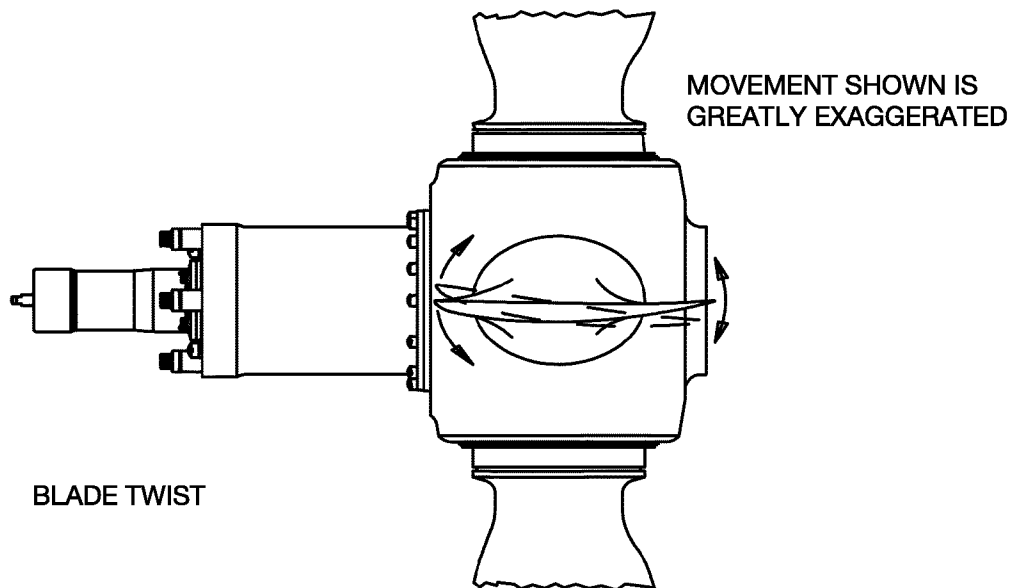
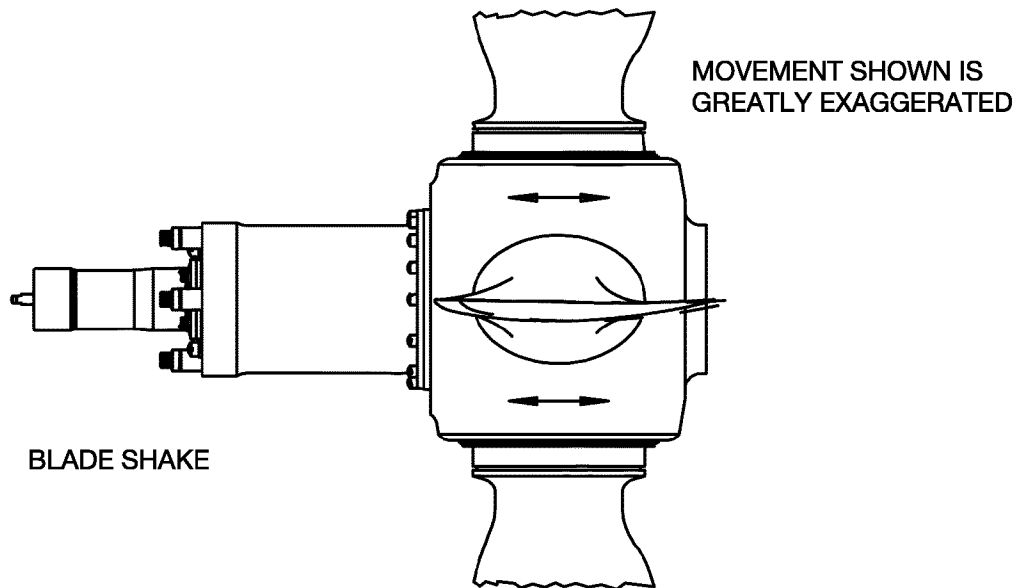
- (1) Use a clean cloth dampened with mineral spirits to clean the blade of all traces of oil and dirt.

CAUTION: Never exceed the published engine operational limits.

- (2) Run the engine and cycle the propeller at least five times.
 - (a) Piston airplanes: cycle from low to high pitch.
 - (b) Turbine airplanes: cycle from reverse to high pitch.
- (3) Check the blade for signs of continued leakage.
 - (a) If necessary, clean the blade again with a cloth dampened with mineral spirits to clean the blade of all traces of oil and dirt.
- (4) Run the engine and cycle the propeller at least five times.
 - (a) Piston airplanes: cycle from low to high pitch.
 - (b) Turbine airplanes: cycle from reverse to high pitch.
- (5) If the leak has stopped completely, no other action is required.
- (6) If the rate of leak has decreased, it is permissible to continue operation of the propeller for up to 20 hours.
 - (a) If there is leakage after 20 hours, the propeller must be removed from the aircraft and sent to an FAA approved Part 145 Propeller Repair Station or international equivalent for repair.
- (7) If the rate of leakage increases, do not operate the propeller. Immediately send the propeller to a McCauley authorized propeller service facility.

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Blade Shake and Blade Twist
Figure 101 (Sheet 1)

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- C. Oil leaks at locations other than blades.
 - (1) Piston aircraft propellers.
 - (a) Leakage from the cylinder area requires removal of the propeller and repair by an FAA approved Part 145 Propeller Repair Station or international equivalent.
 - (b) If leaks are found on any other spot on the blade or the hub, remove the propeller and repair by an FAA approved Part 145 Propeller Repair Station or international equivalent.
 - (c) Leaks at the hub/propeller shaft interface requires removal of the propeller and replacement of the rear hub O-ring.
 - (2) Turbine aircraft propellers
 - (a) Leakage from the cylinder or support plate area requires removal of the propeller and repair by an FAA approved Part 145 Propeller Repair Station or international equivalent.
 - (b) Leaks at the hub/propeller shaft interface requires removal of the propeller and replacement of the rear hub O-ring.
 - (c) A leak from the actuating spring area is engine oil and must be corrected immediately to prevent engine damage from lubrication oil depletion.
 - (d) If leaks are found on any other spot on the hub, remove the propeller and arrange to have the propeller repaired by an FAA approved Part 145 Propeller Repair Station or international equivalent.

14. Propeller Overspeeding

- A. During normal operation, the propeller suddenly overspeeds past rated RPM.
 - (1) Possible Causes:
 - (a) A number of factors can cause propeller overspeeding, but these are normally caused by the engine or governor.
 - (2) Corrective Action:
 - (a) Refer to Propeller Overspeed Inspection Requirements, for required action after an overspeed incident.

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PROPELLER MAINTENANCE PRACTICES

1. Ground Support Equipment

A. The following special equipment is required for field maintenance of McCauley propellers.

| NAME | PART NUMBER | MANUFACTURER | USE |
|--|-------------|------------------------|--|
| Propeller protractor | | Commercially available | To measure blade angles on 600, 650, and 1100 Series propellers. |
| Torque wrench adapter | B-5588 | McCauley | To torque turbine propeller mounting nuts. |
| Feedback collar retractor | D-5945 | McCauley | To aid in removal and installation of C700, C750, and C1000 series propellers. |
| Start lock release tools | B-5021 | McCauley | To release start locks on C600, C650, and C1100 series propellers. |
| Beta tube installation and adjustment tool | B-5378 | McCauley | To install and adjust beta tube on C600, C650, and C1100 series propellers. |

2. Procedures For Maintenance

A. Maintenance begins with the operator and includes inspection together with regular care. Many maintenance tasks that may be accomplished at a minimum cost can extend the life of the propeller and reduce or prevent costly repairs. The following is a listing of what operators of aircraft CAN and CANNOT DO.

B. Operators CAN do the following:

NOTE: The following activities are not preventive maintenance activities as defined by Title 14 of the Code of Federal Regulations, Part 43. Appendix A, Major Alterations, Major Repairs, and Preventive Maintenance.

- (1) Perform a visual preflight inspection of the blades for nicks, scratches, dents, erosion, corrosion, cracks, etc. Apparent damage found should be referred to an appropriately rated mechanic. A crack or bend is cause for the removal of the propeller.
- (2) Check the propeller spinner attaching screws for security and check the spinner for damage.
- (3) Check the propeller for evidence of oil or grease leakage.
- (4) Clean propeller blades periodically using fresh water, a non-alkaline cleaner and a soft cloth or soft brush. Dry with a soft cloth.

NOTE: Always have a blade pointing down to prevent moisture from collecting in the hub.

- (5) For propellers operating in corrosive environments, such as agricultural or coastal operations:
 - (a) Clean the area of the propeller blade snap rings and the propeller hub blade sockets with water, soft bristle brush (do not use a hard bristle brush), and clean towel.
 - 1 Remove as much foreign material from the propeller blade retaining ring area as possible.
 - (b) Make sure the propeller blade retaining ring area is dry.
 - (c) Apply LPS 3® Rust Inhibitor to the retaining ring area at the base of the propeller blades and hub sockets.
 - (d) Apply LPS 3® as frequently as necessary to prevent corrosion.

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- (6) Ensure that the tachometer is appropriately marked for operational limitations of the propeller and that the tachometer accuracy is checked at periodic inspection intervals.
- (7) Make sure that the applicable installation, information, and warning decals are on the propeller. These decals may include warnings against pushing or pulling on the propeller, the model number, the correct bolt torque, and dynamic balancing information.
- (8) Make sure each propeller has its own maintenance record.
- (9) The operator must arrange for the overhaul of the propeller when it reaches the McCauley recommended service time limits. Refer to Time Between Propeller Overhaul for required propeller overhaul intervals.
- (10) For safety and glare reduction for conventional single-engine tractor type aircraft, make sure the face (back) side of each propeller blade is painted flat black and the propeller tips on the camber (forward) side of each blade are painted with the appropriate colors to ensure good visibility. Make sure that any propeller paint touch up is done equally to each blade so that the balance of the propeller is not disturbed. Pusher props may have unique paint color requirements for good visibility for ground personnel. Refer to McCauley's maintenance documents.
- (11) McCauley spinners can be polished, use commercially available polishing compounds.

C. Operators CANNOT do the following:

NOTE: The following is a listing of actions that shall not be performed on or subject a McCauley propeller or component to.

- (1) Do not operate any aircraft after the propeller has been subjected to impact damage without a thorough inspection and has been approved for return to service by an appropriately rated person or repair facility.
- (2) Never straighten a damaged propeller. Even partial straightening of blades to ease shipment to a repair facility may result in hidden damage not being detected and an unairworthy propeller being returned to service.
- (3) Never repair any blade defect by welding, heating, or peening. This can induce premature blade failure.
- (4) Never chrome plate a spinner. Plating will cause cracks and spinner failure.
- (5) Do not attempt to repair or modify a propeller spinner or spinner components. Welding, riveting or bonding are not permitted on the spinner or spinner components.
- (6) Do not polish propeller blades unless specifically permitted by McCauley's instructions.
- (7) Do not fill any damaged areas of metal blades with bulk-filler materials such as epoxy or auto body fillers. This prevents areas of potential cracking from being inspected. Additionally, filling a damaged area will not correct the stress risers caused by the dent or those caused by the loading that introduced the dent.
- (8) Do not paint over areas of corrosion on blades. Corroded areas must be removed in accordance with approved procedures prior to applying the approved protective finish.
- (9) Do not run up engines in areas containing loose rocks, gravel, or debris. Avoid quartering rear winds during ground run-up because this activity can cause damaging stresses.
- (10) Do not push or pull on propeller blades when moving the aircraft by hand. Tow bars are specifically designed for this operation.
- (11) Never install a propeller on an aircraft unless it is a model approved by the aircraft type certificate data sheet (TCDS) or an appropriate supplemental type certificate (STC). The service history must be properly documented, and a pre-installation inspection must indicate that the propeller is airworthy.

3. Long Term Storage of Controllable Pitch Propellers

- A. The following is applicable to new and overhauled propellers prior to entering service (engine installation) or at any time the propeller is removed from service. Storage time is determined from date of manufacture, overhaul, or removal from aircraft.
- (1) Storage must be in a clean and dry environment, preferably in the original shipping carton and above ground level, to minimize exposure to dirt and moisture.

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- (2) If the storage period exceeds 2 years before entering service or returning to service perform the following inspection:
 - (a) For all propeller models, inspect externally for damage and corrosion. Inspection may be accomplished by an A & P mechanic or international equivalent. Make a logbook entry stating compliance with this inspection requirement. Make a reference to MPC26 and include the current revision level of this manual with the logbook entry stating compliance with this inspection requirement.
 - (b) For non-oil-filled propeller models or propellers stored with one or more propeller blades removed, remove propeller cylinder, inspect for internal corrosion and signs of deterioration, and repair as necessary. This must be accomplished only by an FAA approved Part 145 Propeller Repair Station or international equivalent in accordance with the appropriate propeller overhaul manual. Make a logbook entry stating compliance with this inspection requirement. Make a reference to MPC26 and include the current revision level of this manual with the logbook entry stating compliance with this inspection requirement.
- (3) For all propeller models, If storage period exceeds five (5) years, before entering service or returning to service, perform the following inspection and parts replacement:
 - (a) Disassemble as necessary to replace all rubber seals and lubricants. Total disassembly is not required unless evidence of corrosion warrants further disassembly. This must be accomplished only by an FAA approved Part 145 Propeller Repair Station or international equivalent in accordance with the appropriate propeller overhaul manual. Make a logbook entry stating compliance with this inspection requirement. Make a reference to MPC26 and include the current revision level of this manual with the logbook entry stating compliance with this inspection requirement.
 - (b) Inspect parts for damage and corrosion, repair/replace parts as necessary. Work must be accomplished only by an FAA approved Part 145 Propeller Repair Station or international equivalent in accordance with the appropriate propeller service manual. Make a logbook entry stating compliance with this inspection requirement. Make a reference to MPC26 and include the current revision level of this manual with the logbook entry stating compliance with this inspection requirement.

4. Dynamic Balance

NOTE: Some aircraft manufacturers do not approve dynamic balance of the propeller because of potential crack damage to spinner bulkhead from the installed weight.

A. Recommended test equipment.

| NAME | NUMBER | MANUFACTURER | USE |
|------------------|--|--|----------------------------------|
| Balance Analyzer | Model 2020 Pro Balancer Analyzer | ACES Systems 10737 Lexington Drive Knoxville, TN 37932-3294 Web: www.Acessystems.com | For propeller dynamic balance |

B. It is highly recommended that this procedure be performed following static balancing. All of the procedures and guidelines listed below should be used in conjunction with the dynamic balance equipment manufacturer's instructions.

- (1) Perform dynamic balance according to balance equipment manufacturer's instructions.
- (2) If the initial reading is over 0.8 ips, McCauley recommends the following should be checked/corrected:
 - (a) Shimming of the spinner shell.
 - (b) Propeller installation (properly torqued and installed flat against the mounting flange).

NOTE: If the shimming of the spinner shell and propeller installation are found to be acceptable but the initial reading is still over 0.8 ips, we recommend the propeller be taken to an FAA approved Part 145 Propeller Repair Station or international equivalent for inspection.

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- (3) If the initial reading is under 0.8 ips, continue the dynamic balance in accordance with the balance equipment manufacturer's instructions.

CAUTION: At no time are static balance weights to be moved to adjust dynamic balance.

- (4) If the test indicates the addition of weights, temporarily place the indicated mass of balance washers in place of the spinner mounting screw at the location indicated by the testing equipment.
(a) An AN970-3 washer weight = 0.144 ounces each (4.1 grams) plus screw (AN502-10-X)
- (5) Repeat the dynamic balance until the correct balance level (approximately 0.07 ips or lower) is achieved.

NOTE: Most dynamic balance equipment manufacturers specify 0.15 - 0.2 ips as being an acceptable level. McCauley Propeller Systems agrees that 0.15 - 0.2 is an acceptable level, but our experience has shown that 0.07 ips or lower is noticeably smoother.

- (6) When dynamic balance is satisfactory:
(a) Remove balance washers and screw from the spinner attach screw hole.
(b) Permanently mount the balance washers and screws to the spinner bulkhead assembly at a point adjacent to the test location as shown on Figure 203.
- (7) Always place at least one balance weight under screw head for stress relief (see Figure 203). Return original spinner screw to hole.

WARNING: Use extreme care when you drill bulkheads near blades to avoid shank damage. Blade shank damage could potentially require propeller disassembly and blade replacement depending on the severity of the damage.

5. Spinner Repair and Chrome Plating

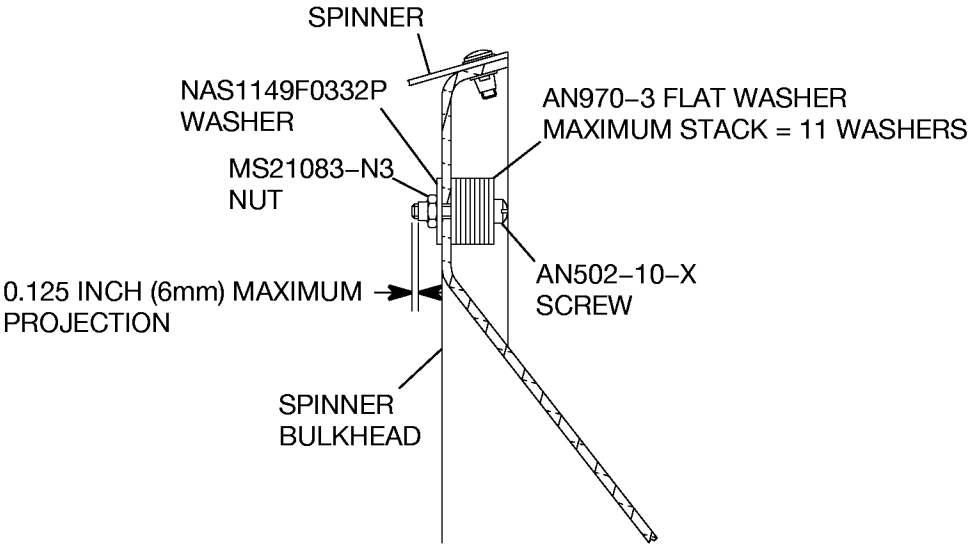
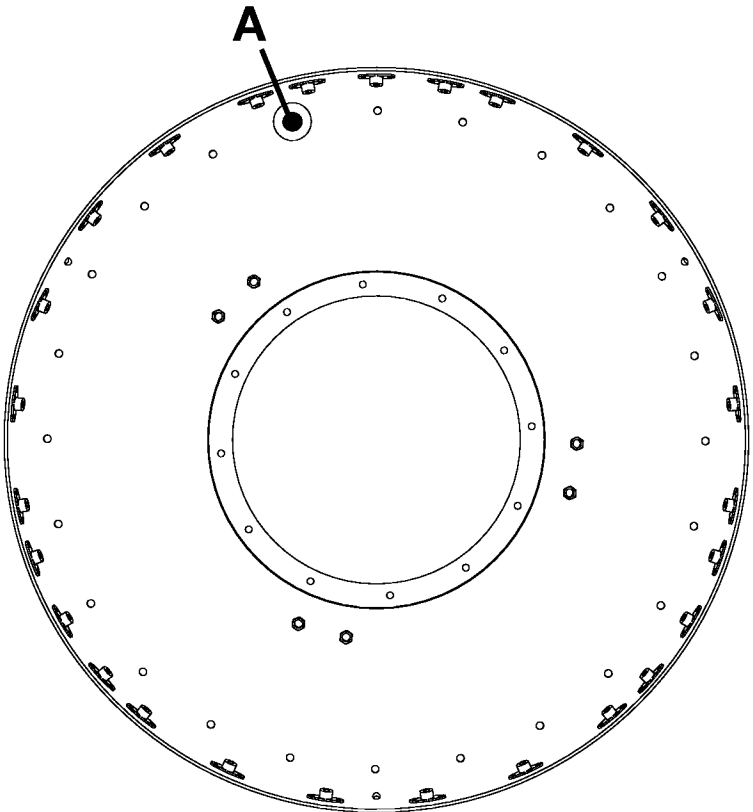
- A. No repair is permitted on any McCauley spinner, spinner front support, or spinner bulkhead. Follow these guidelines to determine if a part is airworthy:
(1) If the part has scratches and minor dents, the part can continue to be used.
(2) If the part is cracked, the part must be replaced.
- B. McCauley strongly discourages the chrome plating of McCauley propeller spinners. Field experience has shown that chrome plated spinners often peel after a short time in service. Strong evidence also exists that chrome plating can lead to spinner fatigue cracking, thus scrapping the spinner shell. Chrome plating will void the McCauley warranty.

6. Propeller Internal Lubrication

- A. Servicing of Propeller Internal Lubrication
(1) General
(a) Unless significant oil leakage is observed, periodic servicing of the oil in McCauley oil filled propellers is not necessary.

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Balance Weight Installation
Figure 201 (Sheet 1)

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PROPELLER REMOVAL/INSTALLATION

1. Ground Support Equipment

A. The following special equipment is required for field maintenance of McCauley propellers.

| NAME | PART NUMBER | MANUFACTURER | USE |
|--|-------------|--------------|---|
| Spacer Removal Tool | A-8029 | McCauley | To separate and remove the propeller spacer from the propeller hub for 1A162 model propellers only. |
| Torque wrench adapter | B-5588 | McCauley | To torque turbine propeller mounting nuts. |
| Feedback collar retractor | D-5945 | McCauley | To aid in removal and installation of C700, C750, and C1000 series propellers. |
| Beta tube installation and adjustment tool | B-5378 | McCauley | To install and adjust beta tube on C600, C650, and C1100 series propellers. |
| Start Lock Release | B-5021/2 | McCauley | To release the start locks on 600, 650, and 1100 series propellers |

2. Uncrating and Acceptance Checking a New Propeller

A. Uncrating the propeller.

- (1) Place the crated propeller in an area that has good lighting and where there is sufficient room to remove the crating and packaging material with the propeller laying flat against the floor or table top of sufficient size to support the propeller (with the propeller mounting flange facing down).
- (2) Inspect the exterior of the crated propeller for signs of damage. If there are any signs of damage, make sure the propeller is thoroughly inspected in the area of the observed crate damage after it has been removed from the packaging material.
- (3) Remove the crate and packaging material.

NOTE: McCauley uses a variety of shipping containers and materials. For two and three blade propellers, the crating material is almost always corrugated cardboard, with the box in the shape of a rectangle or a "Y". Four and five blade propellers are shipped in a square box usually made of wood.

- (4) After the propeller is free of the crate and packaging material, place the propeller on a propeller stand of sufficient size to safely hold the propeller.

CAUTION: Never store or stand a propeller on a propeller blade tip. Damage to the propeller may occur if it is not properly handled after it has been removed from the shipping container.

- (5) Do a visual inspection of the propeller blades and hub for surface damage such as dents, nicks, scratches, and corrosion. Sight down the edges of each propeller blade to make sure there is no deformation.

NOTE: It is possible for a propeller to sustain shipping damage while crated and for the shipping container to not sustain substantial damage as a result of the shipping damage.

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- (6) Retain the installation parts that are shipped with the propeller for use when the propeller is to be installed.

NOTE: If the propeller has been shipped with one or more of the propeller blades removed from the hub, the propeller must be reassembled by an FAA approved Part 145 Propeller Repair Station or international equivalent.

3. Fixed Pitch Propeller Removal and Installation

A. General

- (1) Propeller removal and installation shall be performed only by qualified maintenance personnel. The following instructions are general in nature. The aircraft maintenance manual or STC installation instructions should always be consulted for any specialized procedures applicable to a specific aircraft. Various spinner arrangements not manufactured by McCauley may be used which require additional procedures.

NOTE: Qualified maintenance personnel means the person doing the maintenance activity is the holder of, or is working under the direct supervision of, the holder of the appropriate rating to approve the propeller for return to service after the maintenance activity has been accomplished.

- (2) In the following instructions, installation of propeller is based on the assumption that a McCauley spinner will be used. If a spinner is not used or if the spinner is not manufactured by McCauley, omit those steps which apply to the spinner.

WARNING: Verify that engine magnetos have been grounded prior to approaching the propeller.

B. Spinner Assembly Removal

- (1) Make an alignment mark on the spinner shell, aft bulkhead and adjacent blade with a felt tip pen. This index mark ensures accurate restoration of spinner shell position to lessen the distortion of any dynamic balance previously performed on the propeller assembly.
- (2) Remove screws and washers from the spinner and fillet assemblies (if fillet assemblies are installed).
- (3) Remove spinner from the bulkhead and fillet assemblies (if fillet assemblies are installed).
- (4) If required, remove screws and washers attaching fillets to bulkhead and remove fillets. Identify location of each fillet to the bulkhead.

NOTE: On some spinner assemblies, the fillets are riveted in place and cannot be removed from the bulkhead assembly.

C. Propeller Removal

- (1) Remove cowlings as required for access to mounting nuts.

NOTE: Not all propellers use nuts to secure the propeller mounting bolts.

- (2) Remove the safety wire from the bolts if installed.
- (3) Break the torque on the propeller mounting bolts and nuts.
- (4) Support the propeller, remove the mounting bolts and remove the propeller from the engine crankshaft flange.

NOTE: Some propeller spinner front supports use the propeller mounting bolts to hold the front spinner support in position on the propeller.

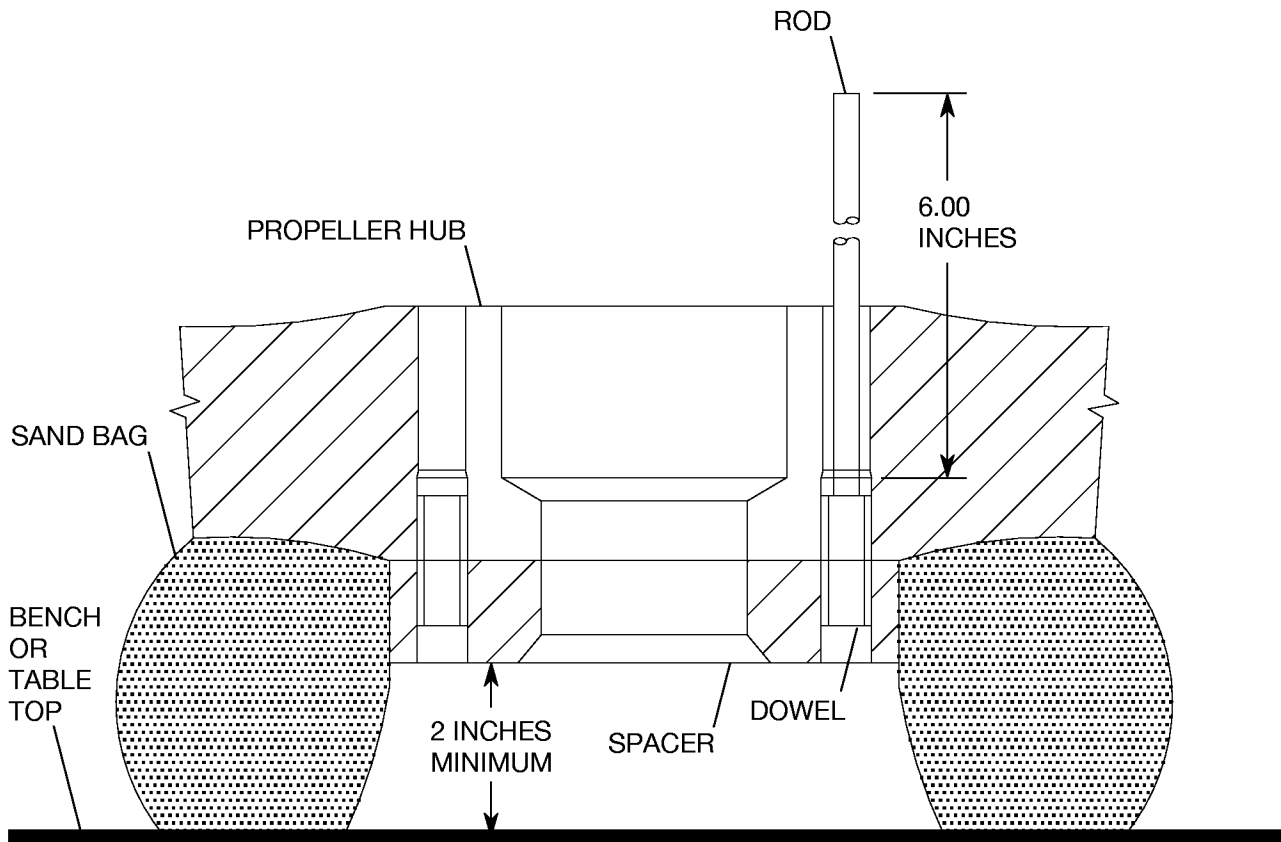
NOTE: If you have not removed or installed the propeller and spinner assembly from the engine before, the use of a propeller sling and hoist is recommended to prevent accidental damage to the propeller. If a hoist is not available, the propeller may be supported and lifted by hand. Make sure an adequate number of people are available to support the propeller if a hoist is not used.

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- (5) Place the propeller on a suitable work surface.
- D. Spacer Removal (If Installed).
- (1) For all fixed pitch propellers (except 1A162 model propellers) with a spacer installed, (Refer to Figure 401).
- NOTE:** The following procedure should be used to remove a rear spinner bulkhead, when it is clamped between a spacer and the propeller hub.
- (a) Support the propeller by nesting it between two shot or sand-filled bags.
- (b) Put the supports as close to the hub as possible with the spacer down facing the bench or table top.
- (c) Make sure you allow sufficient clearance (approximately 2 inches) for the spacer to separate from the hub.
- (d) Select a punch with the proper diameter, approximately 6 inches long, and insert it into the dowel pin hole.
- (e) Alternately tap one dowel and then the other with light hammer blows to free the spacer from the propeller hub.
- (2) For 1A162 model propellers with a spacer installed, (Refer to Figure 402).
- (a) Tool Fabrication
- NOTE:** The spacer removal tool can be fabricated locally or a tool, part number A-8029, can be purchased from McCauley.
- 1 Use a steel bar that is at least 0.250 inch (6.35 mm) thick and 2.00 inches (51.00 mm) wide and 6.0 inches (152.0 mm) long.
- 2 Drill two 0.250 inch (6.35 mm) holes in the steel bar that are 2.875 inches apart, +0.020 or -0.020 inches (73.03 mm, +0.5 mm or -0.5 mm) and 1.438 inches, +0.020 or -0.020 inches (36.53 mm, +0.5 mm or -0.5 mm) from the center of the steel bar.
- (b) Remove the propeller and spacer assembly from the airplane.
- (c) Spacer Removal Procedure (Refer to Figure 402).
- 1 Attach the spacer removal tool to the propeller spacer using two 0.250 inch diameter bolts with UNC-3A threads.
- NOTE:** Bolts to be used should be made of steel, 0.250 inch in diameter, have a UNC-3A thread and the grip length sized to match the thickness of the steel bar. For steel bars that are 0.250 inch (6.35 mm) thick, a MS20074-04-06 bolt is an appropriate sized bolt for this application.
- 2 Position the propeller and spacer assembly under an arbor press or similar tool as shown in Figure 402.
- 3 Place two propeller mounting bolts or equivalent sized steel dowels in the propeller and spacer assembly. The bolts or dowels that are used to push the spacer from the propeller must be of equal length.
- CAUTION:** Do not use bolts that will be returned to service for this procedure. This procedure can damage the threads of propeller mounting bolts.
- 4 Make sure there is at least 2.00 inches (50 mm) clearance between the spacer removal tool attached to the propeller spacer and the work surface supporting the sandbags.
- 5 Using an arbor press or similar tool, push the bolts or dowels down to remove the spacer from the propeller.
- 6 Once the spacer is separated from the propeller, remove the 0.250 inch bolts and the spacer removal tool from the spacer.
- E. Propeller Installation for all fixed pitch propellers (except 1A162 model propellers).

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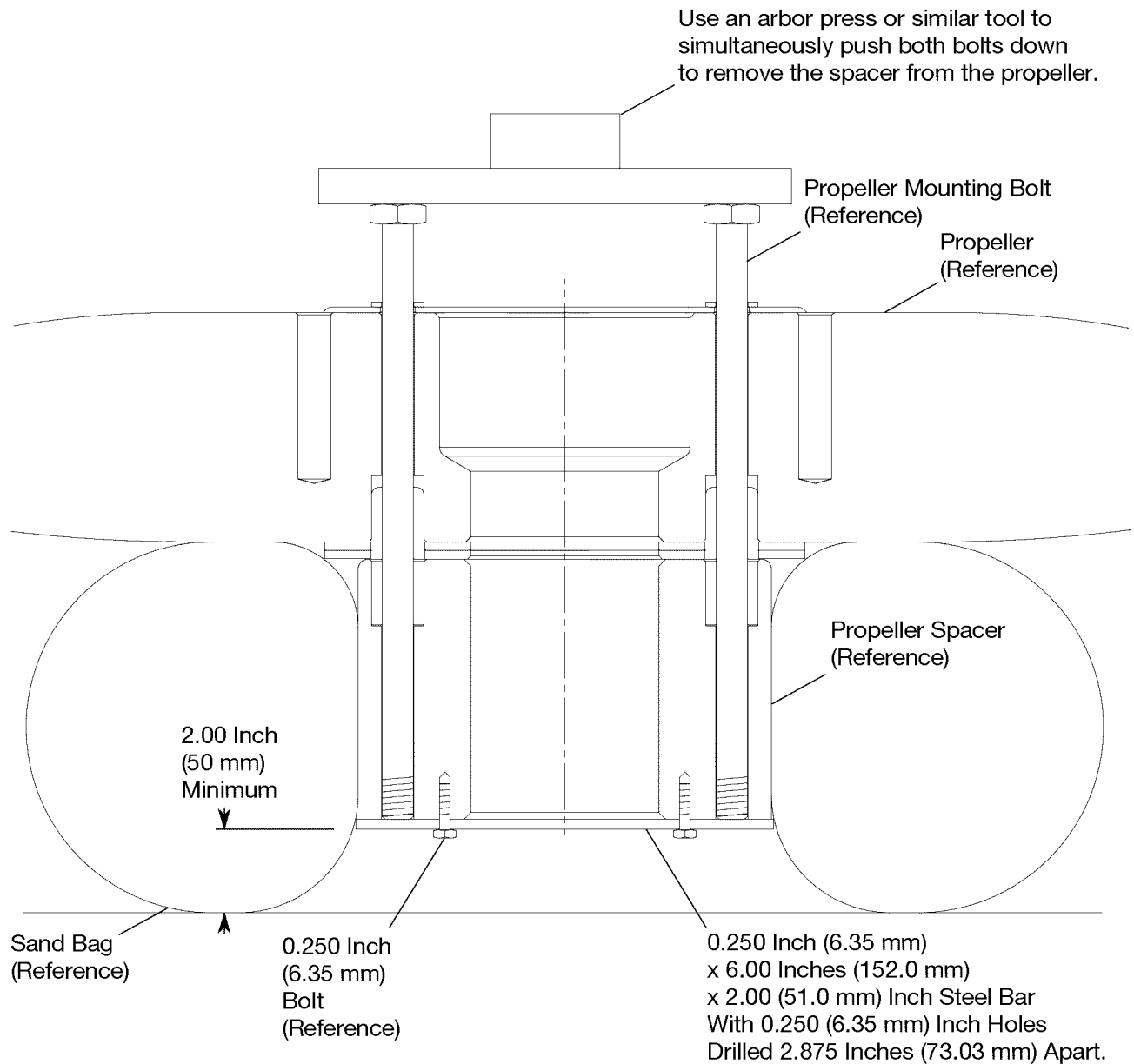


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Remove Spacer From Propeller
Figure 401 (Sheet 1)

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Remove Spacer From Propeller (1A162 Only)
 Figure 402 (Sheet 1)

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WARNING: MAKE SURE THE MAGNETO IS GROUNDED BEFORE INSTALLING THE PROPELLER OR CONNECTING EXTERNAL POWER.

NOTE: McCauley recommends that propeller mounting nuts (if applicable) be replaced at each propeller installation, whenever possible. However, nuts may be reused providing the threads are in good condition and the locking material prevents turning of the nut on the stud by hand. Propeller mounting bolts must be magnetic particle inspected in accordance with ASTM E-1444 or replaced whenever the propeller is removed from the engine.

NOTE: The aircraft maintenance manual or STC installation instructions should always be consulted for any specialized procedures applicable to a specific aircraft. Various spinner arrangements not manufactured by McCauley may be used which require additional procedures.

- (1) Make sure the mating surfaces of the propeller, crankshaft flange, spinner bulkheads, and spacer, if installed, are clean.
- (2) For propeller installations that use a spacer between the propeller and the crankshaft flange and the spacer has been removed from the propeller, do the following:
 - (a) Make sure the serial number stamped on the spacer is the same as the serial number stamped on the propeller.
 - (b) Make sure the alignment dowels are secure in the spacer.

NOTE: If a matched serial number pair of propeller and spacer is not available or if a dowel is loose, the propeller assembly must be taken to an FAA approved Part 145 Propeller Repair Station or international equivalent. If the serial numbers do not match, then the static balance of the propeller is unknown and should not be installed. If a dowel is loose, the dowel will need to be replaced.

- (3) Install the spacer and, if applicable, the aft spinner bulkhead on the propeller.
 - (a) Locate propeller hub on a padded arbor press table, spacer-mating surface face up.
 - (b) Make sure the serial number on the spacer aligns with the number 1 propeller blade.

NOTE: If the number 1 propeller blade cannot be identified, align the spacer serial number to the propeller blade with the propeller serial number.

- (c) Position the spinner bulkhead, if applicable, on the dowel pins between the propeller and spacer.

NOTE: The spinner aft bulkhead must be positioned so that the propeller blades emerge from the bulkhead and spinner with ample clearance. Make sure the felt tip marker line on the spinner aft bulkhead aligns with the mark on the propeller blade.

- (d) Apply a film of oil on the dowel pins.
 - (e) Press the propeller and spacer together with the arbor press. Make sure you do not scratch, dent or deform the propeller or spacer during this assembly operation.
 - (4) The assembled propeller, dowel and spacer should be a press fit and not separate easily.

NOTE: When the dowels are in position, the dowels will be engaged approximately half in the spacer or crankshaft flange and half in the propeller hub.

- (5) Assembly of the spinner installation is completed as the propeller is installed on the engine crankshaft flange. Some installations have the spinner aft bulkhead held between the propeller hub and the spacer. Other installations may have the front bulkhead clamped by the mounting

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bolts or nuts and the rear bulkhead clamped between the propeller and the crankshaft flange or starter ring gear. Some installations use a spacer support pressed into the front propeller hub bore.

NOTE: The aircraft maintenance manual or STC installation instructions should always be consulted for any specialized procedures applicable to a specific aircraft. Various spinner arrangements not manufactured by McCauley may be used which require additional procedures.

NOTE: If you have not installed the propeller and spinner assembly on the engine before, the use of a propeller sling and hoist is recommended to prevent accidental damage to the propeller. If a hoist is not available, the propeller may be supported and lifted by hand. Make sure an adequate number of people are available to support the propeller if a hoist is not used.

- (6) Tighten the propeller mounting bolts with the correct torque. The mounting bolt torque for McCauley fixed pitch propellers is determined by the bolt diameter. Refer to the following table to determine the correct torque for the propeller mounting bolts.

| Bolt or Nut Diameter (Inch) | Torque (Dry) | | |
|--------------------------------|--------------|-------------|------------------|
| | Foot Pounds | Inch Pounds | N-m |
| 3/8 | 25 to 35 | 300 to 360 | 33.895 to 40.675 |
| 7/16 | 40 to 45 | 480 to 540 | 54.233 to 61.012 |
| 1/2 | 55 to 65 | 660 to 780 | 74.570 to 88.128 |

- (a) If an adaptor or extension is attached to torque wrench drive end and this adds to the length of the wrench, then the actual applied torque will be greater than the torque indicated by the wrench reading. The following formula should be used to determine what the torque wrench indicator should read in order to obtain the correct applied torque:

$$\frac{(\text{actual torque required}) \times (\text{torque wrench length})}{(\text{torque wrench length}) + (\text{length of the adapter})} = \text{Torque Wrench Reading to Achieve the Required Actual Torque}$$

- (7) Torque the mounting bolts/nuts in an alternating sequence to prevent the propeller from rocking on the engine flange.
- (8) For propeller mounting bolts with drilled heads, install lockwire (use a minimum diameter of 0.032 corrosion resistant steel conforming to MS20995C32) between pairs of bolt heads.
- (9) When shims are required for location of spinner support, select quantity and thickness so that spinner shell screw holes are misaligned with the rear bulkhead holes or nuts by 1/2 hole diameter. Use at least one mylar shim to contact bolt heads.
- (10) When the correct number of shims has been determined, press or lightly tap support into hub bore, apply force to spinner shell toward propeller to align screw holes with bulkhead holes or nuts and install washers and screws.

NOTE: Make sure the felt tip marker line on the spinner aligns with the marker line on the aft spinner bulkhead and with the marker line on the propeller blade.

F. Propeller Assembly Installation for model 1A162 propellers.

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**WARNING: MAKE SURE THE MAGNETO IS GROUNDED BEFORE INSTALLING
THE PROPELLER OR CONNECTING EXTERNAL POWER.**

NOTE: McCauley recommends that propeller mounting nuts (if applicable) be replaced at each propeller installation, whenever possible. However, nuts may be reused providing threads are in good condition and the locking material prevents turning of the nut on the stud by hand. Propeller mounting bolts must be magnetic particle inspected in accordance with ASTM E-1444 or replaced whenever the propeller is removed from the engine.

NOTE: The aircraft maintenance manual or STC installation instructions should always be consulted for any specialized procedures applicable to a specific aircraft. Various spinner arrangements not manufactured by McCauley may be used which require additional procedures.

- (1) Make sure the mating surfaces of the propeller, crankshaft flange, and spinner bulkheads are clean.
- (2) For propeller installations that use a spacer between the propeller and the crankshaft flange and the spacer has been removed from the propeller, do the following:
 - (a) Make sure the serial number stamped on the spacer is the same as the serial number stamped on the propeller.
 - (b) Make sure the alignment dowels are secure in the spacer.

NOTE: If a matched serial number pair of propeller and spacer is not available or if a dowel is loose, the propeller assembly must be taken to an FAA approved Part 145 Propeller Repair Station or international equivalent. If the serial numbers do not match, then the static balance of the propeller is unknown and should not be installed. If a dowel is loose, the dowel will need to be replaced.

- (3) Install the spacer and, if applicable, the aft spinner bulkhead on the propeller.
 - (a) Locate propeller hub on a padded arbor press table, spacer-mating surface face up.
 - (b) Make sure the serial number on the spacer aligns with the number 1 propeller blade.

NOTE: If the number 1 propeller blade cannot be identified, align the spacer serial number to the propeller blade with the propeller serial number.

- (c) Position the spinner bulkhead, if applicable, on the dowel pins between the propeller and spacer.

NOTE: The spinner aft bulkhead must be positioned so that the propeller blades emerge from the bulkhead and spinner with ample clearance. Make sure the felt tip marker line on the spinner aft bulkhead aligns with the mark on the propeller blade.

- (d) Apply a film of oil on the dowel pins.
 - (e) Press the propeller and spacer together with the arbor press. Make sure you do not scratch, dent or deform the propeller or spacer during this assembly operation.
 - (4) The assembled propeller, dowel and spacer should be a press fit and not separate easily.

NOTE: When the dowels are in position, the dowels will be engaged approximately half in the spacer or crankshaft flange and half in the propeller hub.

- (5) Rotate the engine crankshaft so the number 1 cylinder is Top Dead Center (TDC) on its compression stroke.

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- (6) Position the propeller on the engine crankshaft so the number 1 blade is clocked 60 degrees in the direction of engine rotation from TDC.

NOTE: The number 1 blade will be located at approximately the 10 O'clock position when viewed from in front of the engine looking aft.

NOTE: If you have not installed the propeller and spinner assembly on the engine before, the use of a propeller sling and hoist is recommended to prevent accidental damage to the propeller. If a hoist is not available, the propeller may be supported and lifted by hand. Make sure an adequate number of people are available to support the propeller if a hoist is not used.

- (7) Install propeller on crankshaft flange.

WARNING: Make sure there is no lubricant on the threads of the propeller attach nuts and bolts. If the propeller attach bolts and nuts have lubricant on the threads, the bolts will be over torqued and the propeller could fail.

- (8) Install forward spinner bulkhead, washers, bolts and nuts.
(9) Tighten bolts and torque evenly in accordance with the following table:

| Bolt or Nut Diameter | Torque (DRY) Pound-Feet | Torque (DRY) Pound-Inches | Torque (DRY) Newton Meters (N-m) |
|----------------------|-------------------------|---------------------------|----------------------------------|
| 3/8 | 25 to 30 | 300 to 360 | 33.895 to 40.675 |

- (10) If an adaptor or extension is attached to torque wrench drive end and this adds to its length, then the actual applied torque will be greater than the dial reading. The following formula should be used to find what the dial should read in order to obtain the correct applied torque:

$$\frac{(\text{actual torque required}) \times (\text{torque wrench length})}{(\text{torque wrench length}) + (\text{length of the adapter})} = \text{Torque Wrench Reading to Achieve the Required Actual Torque}$$

- (11) Torque the mounting bolts/nuts in an alternating sequence to prevent the propeller from rocking on the engine flange.
- (12) Safety wire propeller mounting bolts. Install the safety wire around the bolt heads. Do not install the safety wire over the top of the bolt head.
- (13) Spinner Installation (if applicable)
- Put the spinner shell onto the bulkhead with the alignment marks matched.
 - Press firmly aft on the spinner.
 - Push on the spinner shell and use an awl or a small punch in an adjacent hole to move the spinner shell screw hole into alignment with bulkhead hole and install washer and screw. Repeat this procedure on opposing holes until eight evenly spaced screws and washers are installed.
 - Secure propeller spinner to the bulkhead with remaining screws and washers.

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4. Constant Speed Reciprocating Engine Propeller Removal and Installation (Piston)

A. General

- (1) Propeller removal and installation shall be performed only by qualified maintenance personnel. The following instructions are general in nature. The aircraft maintenance manual or STC installation instructions should always be consulted for any specialized procedures applicable to a specific aircraft. Various spinner and deice arrangements not manufactured by McCauley may be used which require additional procedures.

NOTE: Qualified maintenance personnel means the person doing the maintenance activity is the holder of, or is working under the direct supervision of, the holder of the appropriate rating to approve the propeller for return to service after the maintenance activity has been accomplished.

- (2) In the following instructions, installation of propeller is based on the assumption that a McCauley spinner will be used. If a spinner is not used or if the spinner is not manufactured by McCauley, omit those steps which apply to the spinner.

WARNING: Verify that engine magnetos have been grounded prior to approaching the propeller.

B. Spinner Assembly Removal

CAUTION: Make sure you do not damage or scratch the blades when removing the spinner shell.

- (1) Make an alignment mark on the spinner shell, spinner aft bulkhead and adjacent blade with a felt tip pen. This index mark ensures accurate restoration of spinner shell position to lessen the distortion of any dynamic balance previously performed on the propeller assembly.
- (2) Remove screws and washers from the spinner and fillet assemblies.
- (3) Remove spinner from the bulkhead and fillet assemblies.
- (4) Remove the spinner support and shims from the front of the propeller cylinder.
- (5) If required, remove screws and washers attaching fillets to bulkhead and remove fillets. Identify location of each fillet to the bulkhead.

NOTE: On some spinner assemblies, the fillets are riveted in place and cannot be removed from the bulkhead assembly.

C. Propeller Assembly Removal

- (1) Remove cowling as required for access to mounting nuts.
- (2) If required, remove the deice leads.
- (3) Place a drip pan under the propeller mounting surface to catch any spilled engine oil when the propeller is removed.
- (4) Break the torque on the propeller mounting nuts on Continental engine installations. For Lycoming installations, remove safety wire from the stud and nut assembly and break the torque.
- (5) Install the propeller sling and attach to a hoist. If a hoist is not available, the propeller may be supported and lifted by hand.

NOTE: Make sure an adequate number of people are available to adequately support the propeller if a hoist is not used.

- (a) The straps of the propeller sling should be placed on two of the propeller blades at least 6 inches (152 mm) outboard of the propeller hub for three blade propellers and 12 inches (305 mm) outboard of the propeller hub for two bladed propellers. Make sure you protect the deice boots or anti-ice shoes from potential propeller sling abrasion damage, if installed.
- (b) The sling and hoist should have a weight limit rating at least twice the weight of the propeller that is to be removed.

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- (6) Take up slack on the propeller sling and hoist, or support the propeller by hand, and remove the nuts or bolts.

CAUTION: Propeller must be removed from engine in a straight motion. Any rocking on the engine could cause damage to the propeller mounting flange. For Lycoming propeller installations, care must be taken to remove the propeller in a straight forward motion as the propeller stud and nut assembly are loosened from the engine crankshaft flange.

- (7) Carefully slide the propeller forward and remove from the engine.
- (8) Place the propeller on a suitable support or propeller stand.
 - (a) Do not let the propeller be supported by the tips of the propeller blades or "stand" the propeller on the propeller blade tips.
 - (b) The stand should be able to hold the propeller securely and have a weight limit rating at least twice that of the removed propeller.
 - (c) Make sure the propeller is protected from damaged while in the stand. All areas of the stand that come in contact with the propeller should be padded sufficiently to prevent abrasion damage to the propeller.
- (9) Install a protective cover over the propeller hub mounting flange.
- (10) Install a protective cover over the open end of the engine propeller flange.

D. Propeller Assembly Installation

NOTE: McCauley recommends that propeller mounting nuts (if applicable) be replaced at each propeller installation, whenever possible. However, nuts may be reused providing threads are in good condition and the locking material prevents turning of the nut on the stud by hand.

- (1) If required, attach bulkhead mounting ring or bulkhead to hub. Make sure the (felt tip pen) alignment marks between the bulkhead and the propeller blade are in alignment.
- (2) Remove the protective cover from the end of the engine propeller flange.
- (3) Ensure that engine propeller flange, hub mounting flange, dowels and holes, mounting studs and holes are clean, dry, and free of damage and foreign material.
- (4) Remove protective cover from the propeller hub mounting flange.
- (5) Ensure that a new McCauley O-ring (A-1633-3 or A-1633-49, Continental engines) (A-1633-11, Lycoming engines) is installed in the groove of the propeller hub mounting flange. Lubricate the O-ring with engine oil prior to installation of propeller.

NOTE: In the past, new propeller assemblies shipped from McCauley, the propeller hub/engine O-ring was installed in the O-ring groove of new propellers and hub assemblies. This practice has been discontinued. The O-ring is now included in the propeller unattached parts kit, which is included in the box with the propeller or hub assembly. Install the O-ring according to the assembly instructions in this Owner/Operator Manual.

- (6) Install the propeller sling and attach to a hoist. If a hoist is not available, the propeller may be supported and lifted by hand.

NOTE: Make sure an adequate number of people are available to support the propeller if a hoist is not used.

- (a) The straps of the propeller sling should be placed on two of the propeller blades at least 6 inches (152 mm) outboard of the propeller hub for three blade propellers and 12 inches (305 mm) outboard of the propeller hub for two bladed propellers. Make sure you protect the deice boots or anti-ice shoes from potential propeller sling abrasion damage, if installed.

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- (b) The sling and hoist should have a weight limit rating at least twice the weight of the propeller that is to be installed.
- (7) Position the propeller close to the engine propeller flange and align the dowel pins with the dowel pin holes if applicable.

CAUTION: Propeller must be installed straight onto engine flange. Any rocking of propeller relative to flange could result in damage to engine/propeller flange mating surfaces.

- (8) Mount the propeller on the engine propeller shaft. Trap the aft spinner bulkhead between the hub and engine mounting flange if applicable. Make sure the index marks made with a felt tip pen align between the aft spinner bulkhead and the propeller blade.
- (9) Ensure threads of nuts and studs are free of burrs, nicks, and similar damage, and clean of foreign material.
 - (a) For Continental, Franklin, and Orenda engine installations:

WARNING: If the lubricant is not applied as required, the nuts will be under torqued, and the propeller could fail.

CAUTION: Do not use oil as a substitute for approved lubricant. It is imperative that the correct specification of lubricant be used during installation. Substitution of the approved grease with an unapproved lubricant (or no lubricant) could result in under-torquing or severe over-torquing of propeller attaching parts.

- 1 Lubricate the threads of studs and nuts and the faces of nuts, spacers, or washers with MIL-PRF-83483 (McCauley part number A-1637-16) grease.
- 2 Install mounting nuts on mounting studs.
- 3 Torque the mounting nuts in an alternating sequence to prevent the hub rocking on the engine flange.
- 4 When the hub is seated fully on the engine flange, torque to the specification called out in the mounting decal located on propeller hub at the number 1 socket.

NOTE: If the decal containing the propeller installation instructions is missing or illegible, install a new decal. For all applicable Continental engine installations use a part number A-2230-9 decal except installations that use the model 3FF32C501 propeller. The model 3FF32C501 propeller requires the part number A-2230-7 decal. All Franklin engine installations use a part number A-2230-9 decal. All Orenda engine installations use a part number A-2230-7 decal.

NOTE: McCauley C1 through C98 model propellers are not applicable to this manual, refer to McCauley Service Bulletin SB227B, or latest revision, for propeller mounting torque information for McCauley C1 through C98 model propellers.

- 5 After you apply the final torque, apply torque seal to nut and stud threads.
- (b) For Lycoming engine installations:

WARNING: Threads must be clean and dry. If any lubricant is applied, the attaching parts will be severely over-torqued.

- 1 Start threads on all propeller mounting nut and stud assembly and then tighten them in an alternating sequence to prevent the hub rocking on the engine flange.

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- 2 When the hub is seated fully on the engine flange, torque to the specification called out on the mounting decal located on propeller hub at the number 1 socket.

NOTE: If the decal containing the propeller installation instructions is missing or illegible, install a new decal. For all Lycoming engine installations use a part number A-2230 decal except installations that use the model 3AF32C524 propeller. The model 3AF32C524 propeller requires the part number A-2230-9 decal.

- 3 Safety wire (0.041 corrosion resistant steel conforming to MS20995C41) the nuts in pairs to complete the installation.

(c) If required, install the deice leads.

- (10) If an adaptor or extension is attached to torque wrench drive end and this adds to its length, then the actual applied torque will be greater than the dial reading. The following formula should be used to find what the dial should read in order to obtain the correct applied torque:

$$\frac{(\text{actual torque required}) \times (\text{torque wrench length})}{(\text{torque wrench length}) + (\text{length of the adapter})} = \begin{array}{l} \text{Torque Wrench Reading} \\ \text{to Achieve the Required} \\ \text{Actual Torque} \end{array}$$

E. Spinner Installation (if applicable)

CAUTION: Under-shimming or over-shimming of the spinner front support could result in spinner wobble, vibration, and/or bulkhead and spinner cracking. Follow shimming procedures carefully.

- (1) If required, install propeller spinner fillets on the bulkhead with screws and washers.
- (2) Insert the same number of shims into spinner support as were removed, and lightly press the spinner support onto propeller cylinder. Make sure the index marks made with a felt tip pen align between the spinner and the propeller blade.
- (3) Put the spinner shell onto the bulkhead and fillet assembly with the alignment marks matched.
 - (a) Press firmly aft on the spinner.
 - (b) Make sure the spinner holes are approximately one-half hole diameter forward of the matching holes in the bulkhead.
 - (c) Add or subtract shims to spinner support until spinner shell mounting holes are approximately half a hole from being in true alignment with bulkhead holes.
- (4) Push on the spinner shell and use an awl or a small punch in an adjacent hole to move the spinner shell screw hole into alignment with bulkhead hole and install washer and screw. Repeat this procedure on opposing holes until eight evenly spaced screws and washers are installed.
- (5) Secure propeller spinner to the bulkhead and fillet assemblies with remaining screws and washers.

5. C600/C650/C1100 Series Propeller Removal and Installation

A. General

- (1) Propeller removal and installation shall be performed only by qualified maintenance personnel. The following instructions are general in nature. The aircraft maintenance manual or STC installation instructions should always be consulted for any specialized procedures applicable to a specific aircraft. Various spinner and deice arrangements not manufactured by McCauley may be used which require additional procedures.

NOTE: Qualified maintenance personnel means the person doing the maintenance activity is the holder of, or is working under the direct supervision of, the holder of the appropriate rating to approve the propeller for return to service after the maintenance activity has been accomplished.

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- (2) In the following instructions, installation of propeller is based on the assumption that a McCauley spinner will be used. If a spinner is not used or if the spinner is not manufactured by McCauley, omit those steps which apply to the spinner.

B. Spinner Assembly Removal

- (1) Make an alignment mark on the spinner, aft spinner bulkhead and an adjacent blade with a felt tip pen. This index mark insures accurate restoration of spinner position to lessen the distortion of any dynamic balance previously performed on the propeller assembly.
- (2) Remove screws and washers from spinner and fillet assemblies.
- (3) Remove spinner from the bulkhead and fillet assemblies.
- (4) Remove spinner support and shims from spinner.
- (5) Remove screws and washers attaching fillets to the bulkhead and remove the fillets.

C. Propeller Assembly Removal

NOTE: Propeller must be on start locks when beginning this procedure.

- (1) Position power lever to full reverse position.
- (2) Activate the propeller unfeathering pump.

NOTE: Do not operate the unfeathering pump more than one minute when oil is cold. Restrict operation to 30 seconds maximum when oil is hot.

- (a) The propeller blades will move toward reverse pitch and unload the start locks.
- (b) Insert start lock release tools (P/N B-5021) in the four holes on the front (forward end) of the propeller cylinder. Refer to Figure 404.
- (c) The tools will move the start lock weights outboard and disconnect the latch from the piston.

NOTE: The start lock release tools should be inserted by hand with a light push. Do not hammer on or forcibly insert the start lock release tools.

- (3) With the propeller blades off of the start locks and the propeller is in full reverse, quickly loosen the beta tube locking screw at the end of the beta tube. Tap the locking pin out of piston rod/ beta tube and remove the locking plug from the beta tube.
- (4) Release (shut off) the unfeathering pump.
 - (a) The blades will start moving toward the feather position.

NOTE: You should hear a faint click as the start locks ride on the start lock release tools and pass over the latch position.

- (5) Remove start lock release tool. The propeller is now free of the start locks and will be in the feather position.
- (6) Use the McCauley beta tube adjustment tool part number B-5378 to unscrew the beta tube. Refer to Figure 404.

CAUTION: Never use a screwdriver or other unapproved tool to remove the beta tube. Use of any tool other than McCauley B-5378 can severely damage beta tube and propeller piston rod threads, rendering parts unusable and unrepairable.

- (a) Count the number of turns that are required to remove the beta tube. Record the number of turns required to free the beta tube for future reference when the propeller is to be installed.
- (7) Once the beta tube is free from all threads, the o-ring will create friction between the piston rod and the beta tube. To overcome the o-ring friction, continue to turn the beta tube counterclockwise while gently pulling on the beta tube removal tool.

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CAUTION: Do not grab the beta tube with pliers or anything which could damage the threads of the beta tube.

- (8) Pull the beta tube out and handle very carefully. Wipe the beta tube with a clean rag and store in a safe place.
- (9) Place a drip pan under the propeller mounting surface to catch any spilled engine oil when the propeller is removed.
- (10) Break the torque on the propeller mounting nuts. (McCauley Torque Wrench Adapter part number B-5588 may be used to gain easier access to mounting nuts). Refer to Figure 403.
- (11) Install a propeller sling and attach to hoist. If hoist is unavailable, propeller may be supported and lifted by hand. This will require additional personnel.

CAUTION: The C600 propellers weigh approximately 120 pounds (54 kg) and the C650 propellers approximately 160 pounds (73 kg). C1100 series propellers weigh 180 pounds (83 kg) or more.

- (a) Hoist straps must be a minimum of 4 inches (100 mm) wide.
- (b) The straps of the propeller sling should be placed on two of the propeller blades at least 6 inches (152 mm) outboard of the propeller hub. Make sure you protect the deice boots or anti-ice shoes from potential propeller sling abrasion damage, if installed.
- (12) The sling and hoist should have a weight limit rating at least twice the weight of the propeller that is to be removed.
- (13) Take up the slack on the propeller sling and hoist, or have at least four persons support the propeller, and remove the nuts.
- (14) Carefully slide the propeller forward and remove from the engine.
- (15) Place the propeller on a suitable support or propeller stand.
 - (a) Do not let the propeller be supported by the tips of the propeller blades or "stand" the propeller on the propeller blade tips.
 - (b) The stand should be able to hold the propeller securely and have a weight limit rating at least twice that of the removed propeller.
 - (c) Make sure the propeller is protected from damaged while in the stand. All areas of the stand that come in contact with the propeller should be padded sufficiently to prevent abrasion damage to the propeller.
- (16) Install a protective cover over the propeller hub mounting flange.
- (17) Install a protective cover over the open end of the engine propeller flange.

D. Propeller Installation

NOTE: McCauley recommends that the propeller mounting nuts (McCauley part number A-1639-32) be replaced at each propeller installation, whenever possible. However, nuts may be reused if the locking material prevents turning of the nut on the stud by hand.

- (1) Remove protective cover from the end of engine propeller flange.
- (2) Make sure the flange is clean and free of nicks and burrs.
- (3) Make sure that the engine propeller flange, dowels, and mounting stud holes are clean, dry, and free of nicks and burrs.
- (4) Remove the protective cover from the propeller hub mounting flange.
- (5) Make sure that the propeller hub mounting flange, dowel pin holes, and mounting studs are clean and undamaged.

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- (6) Make sure that a new O-ring is installed in the groove of propeller hub mounting flange. Lubricate the O-ring with engine oil prior to installation of propeller.

NOTE: Refer to the Installation Parts For Turbine Engine Propellers, Table 1002 for the O-ring part number.

NOTE: In the past, new propeller assemblies shipped from McCauley, the propeller hub/engine O-ring was installed in the O-ring groove of new propellers and hub assemblies. This practice has been discontinued. The O-ring is now included in the propeller unattached parts kit, which is included in the box with the propeller or hub assembly. Install the O-ring according to the assembly instructions in this Owner/Operator Manual.

- (7) Use a propeller sling and hoist, or additional personnel, to position the propeller close to the engine propeller flange and align engine flange dowel pins with the dowel pin holes on the propeller hub mounting flange. Rotate engine propeller mounting flange as required to align the dowel pin holes.
- (a) Hoist straps must be a minimum of 4 inches (100 mm) wide.
 - (b) The sling and hoist should have a weight limit rating at least twice the weight of the propeller that is to be installed.
 - (c) The straps of the propeller sling should be placed on two of the propeller blades at least 6 inches (152 mm) outboard of the propeller hub. Make sure you protect the deice boots or anti-ice shoes from potential propeller sling abrasion damage, if installed.

CAUTION: Propeller must be installed straight onto the engine flange. Any rocking of the propeller with respect to the flange could result in damage to the engine/propeller flange mating surfaces.

- (8) Mount the propeller on the engine propeller shaft.
(9) Ensure threads of nuts and studs are free of burrs, nicks, and similar damage, and clean of foreign material.

WARNING: If the lubricant is not applied as required, the nuts will be under torqued, and the propeller could fail.

- (a) For Garrett (Honeywell) engine installations:

CAUTION: Do not use oil as a substitute for approved lubricant. It is imperative that the correct specification of lubricant be used during installation. Substitution of the approved grease with an unapproved lubricant (or no lubricant) could result in under-torquing or severe over-torquing of propeller attaching parts.

- 1 Lubricate the threads of studs and nuts and the faces of nuts, spacers, or washers with MIL-PRF-83483 (McCauley part number A-1637-16) grease.
- 2 Install mounting nuts on mounting studs.
- 3 Torque the mounting nuts in an alternating sequence to prevent the hub rocking on the engine flange.
- 4 When the hub is seated fully on the engine flange, torque to the specification called out in the mounting decal located on propeller hub at the number 1 socket.

NOTE: If the decal containing the propeller installation instructions is missing or illegible, install a new decal. All Garrett (Honeywell) engine installations, use a part number A-2230-7 decal.

- a McCauley Torque Wrench Adapter:

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CAUTION: If an adaptor or extension (such as McCauley part number B-5588) is attached to torque wrench drive end and this adds to its length, then the actual applied torque will be greater than the dial reading. The following formula should be used to find what the dial should read in order to obtain the correct applied torque:

$$\text{Dial Reading} = \frac{\text{Torque Wrench Length} \times \text{Desired Torque}}{\text{Torque Wrench Length} + \text{Extension Length}}$$

- 5 After you apply the final torque, apply torque seal to nut and stud threads.
(b) If required, install the deice leads.
(10) Install the beta tube.

CAUTION: Never use a screwdriver or similar tool to install the beta tube. Use of any tool other than McCauley B-5378 can severely damage beta tube and propeller piston rod threads, rendering parts unusable and unrepairable.

- (a) Lubricate with turbine oil and install a new O-ring (Garrett part) on beta tube and install using McCauley Beta Tube Adjustment Tool (part number B-5378).
1 Once the beta tube threads are engaged, turn the beta tube the same amount of turns that were required to remove the beta tube. If the number of turns required to remove the beta tube is not known, use 32 turns.
(11) Make sure of proper rigging of engine controls. Refer to the aircraft maintenance manual.
(12) Do a propeller flight idle blade angle check.

NOTE: Refer to the airplane maintenance manual, airplane type certificate (TC), Supplemental Type Certificate (STC) and the propeller type certificate as required for the flight idle propeller blade angle.

- (a) Place the base of the protractor on the top of the propeller cylinder and align it longitudinally to zero the propeller protractor.
(b) Position power lever at the flight idle position.
(c) Activate the unfeathering pump. As oil pressure increases, the propeller blades will rotate from feather towards the flight idle position.

NOTE: Do not operate the unfeathering pump more than one minute when oil is cold. Restrict operation to 30 seconds maximum when oil is hot.

- (d) When the propeller blades have stopped in the flight idle position, move the blade to be tested so the leading edge is up and blade is horizontal.

NOTE: It is required to check the blade angle of only one blade.

- (e) With the unfeathering pump still operating, use a propeller protractor to measure the propeller blade angle at the station indicated by a white or yellow mark on rear surface of the propeller blade (usually will be the 30 inch or 42 inch station).

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CAUTION: Never use a screwdriver or other unapproved tool to adjust beta tube. Use of any tool other than McCauley B-5378 can severely damage the beta tube and propeller piston rod threads, rendering the parts unusable and unrepairable.

CAUTION: Adjustment of the flight idle blade angle must be accomplished as quickly as possible as not to deplete the propeller oil supply.

- (f) If adjustment is necessary, use McCauley tool, part number B-5378, to adjust the beta tube. Turn the beta tube clockwise to decrease blade angle, counterclockwise to increase blade angle.
- (g) Move propeller control to full reverse and install the beta tube locking pin assembly and secure with locking screw (55) torque 25 to 30 inch-pounds (2.82 to 3.39 N-m).
- (13) Feather, start lock, and reverse, blade angles are set during assembly or overhaul. These angles are NOT adjustable in the field.

CAUTION: Do not operate the propeller below the minimum propeller idle speed operating restriction. The minimum propeller idle speed operating restriction is the result of a specific vibratory resonant condition known as "reactionless mode". Ground operation, at or near a reactionless mode vibratory resonance speed, can cause very high stresses in the propeller blades and hubs. These high stresses are more severe when operating in a tailing wind condition. If the propeller is operated within a restricted RPM range or below a minimum RPM restriction for an extended period of time, the propeller blades and hubs may become unairworthy due to fatigue. Hub or blade failure has the potential of causing a catastrophic event due to blade separation. The propeller RPM restriction is often placed below the minimum idle RPM; however, certain aircraft have a restriction that is above the propeller idle RPM setting. Either restriction is important. The propeller operating restrictions or limitations may be found in the Airplane Flight Manual (AFM) or Airplane Flight Manual Supplement (AFMS). The propeller installations may be controlled by the various airframe manufacturers Type Certificate (TC) or by Supplemental Type Certificate (STC).

E. Spinner Installation

CAUTION: Undershimming or overshimming of the spinner aft bulkhead could result in spinner wobble, vibration, and/or bulkhead and spinner cracking. Please follow shimming procedures carefully.

- (1) Install propeller spinner fillets on the bulkhead with screws and washers if required.
- (2) Insert shims into the spinner support and lightly press spinner support onto the cylinder on the front end of the propeller.
- (3) Mount the spinner onto the bulkhead and fillet assembly and check alignment of the mounting holes in the spinner and bulkhead.
 - (a) Make sure that alignment marks on the spinner and propeller blade are matched.
 - (b) Add or subtract shims to the spinner support until spinner mounting holes are aligned within one-half hole with the bulkhead mounting hole diameters while you push hard on the spinner shell.

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- (4) Use an awl or a small punch in an adjacent hole to move the spinner screw hole into alignment with the bulkhead hole and install the screw. Repeat the procedure on opposing holes until eight equally spaced screws and washers are installed.
- (5) Secure the propeller spinner to the bulkhead and fillet assemblies with the remaining screws and washers.

6. C700/C750/C1000 Propeller Removal/Installation

A. General

- (1) Propeller removal and installation should be performed only by qualified maintenance personnel. The following instructions are general in nature. The aircraft maintenance manual or STC installation instructions should always be consulted for any specialized procedures applicable to a specific aircraft. Various spinner and deice arrangements not manufactured by McCauley may be used which require additional procedures.

NOTE: Qualified maintenance personnel means the person doing the maintenance activity is the holder of, or is working under the direct supervision of, the holder of the appropriate rating to approve the propeller for return to service after the maintenance activity has been accomplished.

- (2) In the following instructions, installation of propeller is based on the assumption that a McCauley spinner will be used. If a spinner is not used or if the spinner is not manufactured by McCauley, omit those steps which apply to the spinner.

B. Spinner Assembly Removal

- (1) Make an alignment mark on the spinner, spinner aft bulkhead and an adjacent blade with a felt tip pen. This index mark insures accurate restoration of spinner position to lessen the distortion of any dynamic balance previously performed on the propeller assembly.
- (2) Remove screws and washers from spinner and fillet assemblies.
- (3) Remove spinner from the bulkhead and fillet assemblies.
- (4) Remove spinner support and shims from spinner.
- (5) Remove screws and washers attaching fillets to the bulkhead and remove the fillets.

C. Propeller Assembly Removal

- (1) Make sure the airplane propeller control lever has the FEATHER position selected and the propeller blades are in feather.

NOTE: If the propeller control lever is not in the FEATHER position or the propeller blades are not in feather, consult the Pilot's Operating Handbook for instructions to put the propeller control in the feather position and to feather the propeller.

- (2) Place a drip pan under the propeller mounting surface to catch any spilled engine oil when the propeller is removed.
- (3) Remove the feedback bearing assembly from the feedback collar groove. Refer to the aircraft or engine manual for procedure.
- (4) Remove the cowling as required for access to the mounting nuts.
- (5) Install the D-5945 feedback collar retractor tool to the beta rods.

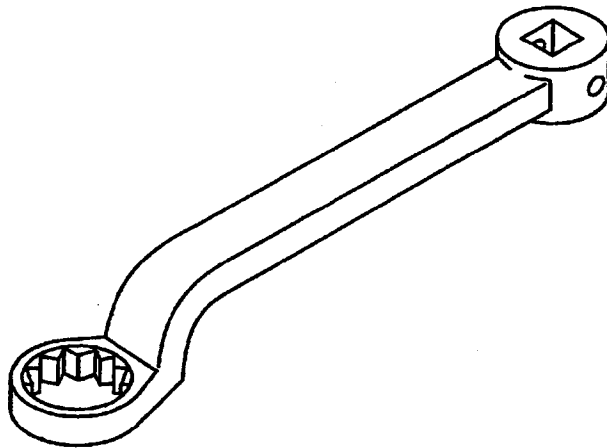
NOTE: Make sure the rods are inserted through the correct holes of the tool. The beta rods must be pulled directly forward.

CAUTION: Do not draw the feedback collar too far forward as the beta rods will be damaged.

- (6) Turn the large threaded rod of the retractor tool clockwise to draw the feedback collar forward to allow access to the propeller mounting nuts.
- (7) Break the torque on the propeller mounting nuts. (McCauley Torque Wrench Adapter part number B-5588 may be used to gain easier access to mounting nuts.) (Refer to Figure 201).

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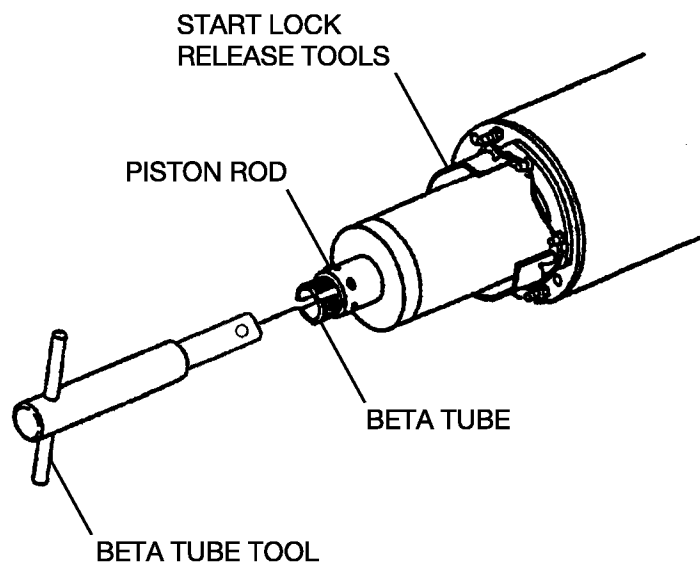
C72



Propeller Torque Wrench Adapter Tool
Figure 403 (Sheet 1)

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C71



Propeller Beta Adjustment and Start Lock Release Tools
Figure 404 (Sheet 1)

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- (8) Install propeller sling and attach to hoist. If hoist is unavailable, propeller may be supported and lifted by hand. This will require additional personnel.

CAUTION: The C700 propellers weigh approximately 120 pounds (54 kg), the C750 propellers approximately 140 pounds (64 kg). C1000 series propellers weigh 180 pounds (83 kg) or more.

- (a) Hoist straps must be a minimum of 4 inches (100 mm) wide.
 - (b) The sling and hoist should have a weight limit rating at least twice the weight of the propeller that is to be removed.
 - (c) The straps of the propeller sling should be placed on two of the propeller blades at least 6 inches (152 mm) outboard of the propeller hub. Make sure you protect the deice boots or anti-ice shoes from potential propeller sling abrasion damage, if installed.
- (9) Take up the slack on the propeller sling and hoist, or have additional personnel support the propeller, and remove the nuts.
- (10) Carefully slide the propeller forward and remove from the engine.
- (11) Place the propeller on a suitable support or propeller stand.
- (a) Do not let the propeller be supported by the tips of the propeller blades or "stand" the propeller on the propeller blade tips.
 - (b) The stand should be able to hold the propeller securely and have a weight limit rating at least twice that of the removed propeller.
 - (c) Make sure the propeller is protected from damaged while in the stand. All areas of the stand that come in contact with the propeller should be padded sufficiently to prevent abrasion damage to the propeller.
- (12) Install a protective cover over the propeller hub mounting flange.
- (13) Install a protective cover over the open end of the engine propeller flange.
- (14) Remove the D-5945 feedback collar retractor tool from the propeller.

D. Propeller Installation

NOTE: McCauley recommends that the propeller mounting nuts (McCauley part number A-1639-32) be replaced at each propeller installation, whenever possible. However, nuts may be reused if the locking material prevents turning of the nut on the stud by hand.

- (1) Install the D-5945 feedback collar retractor tool on the propeller.
- (2) Remove protective cover from the end of engine propeller flange.
- (3) Make sure the flange is clean and free of nicks and burrs.
- (4) Make sure that the engine propeller flange, dowels, and mounting stud holes are clean, dry, and free of nicks and burrs.
- (5) Remove the protective cover from the propeller hub mounting flange.
- (6) Make sure that the propeller hub mounting flange, dowel pin holes, and mounting studs are clean and undamaged.
- (7) Make sure that a new O-ring is installed in the groove of the propeller hub mounting flange. Lubricate the O-ring with engine oil prior to installation of the propeller.

NOTE: Refer to the Installation Parts For Turbine Engine Propellers, Table 1002 for the O-ring part number.

NOTE: In the past, new propeller assemblies shipped from McCauley, the propeller hub/engine O-ring was installed in the O-ring groove of new propellers and hub assemblies. This practice has been discontinued. The O-ring is now included in the propeller unattached parts kit, which is included in the box with the propeller or hub assembly. Install the O-ring according to the assembly instructions in this Owner/Operator Manual.

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- (8) Use a propeller sling and hoist, or additional personnel, to position the propeller close to the engine propeller flange and align engine flange dowel pins with the dowel pin holes on the propeller hub mounting flange. Rotate engine propeller mounting flange as required to align the dowel pin holes.
 - (a) Hoist straps must be a minimum of 4 inches (100 mm) wide.
 - (b) The sling and hoist should have a weight limit rating at least twice the weight of the propeller that is to be installed.
 - (c) The straps of the propeller sling should be placed on two of the propeller blades at least 6 inches (152 mm) outboard of the propeller hub. Make sure you protect the deice boots or anti-ice shoes from potential propeller sling abrasion damage, if installed.

CAUTION: Propeller must be installed straight onto the engine flange. Any rocking of the propeller with respect to the flange could result in damage to the engine/propeller flange mating surfaces.

- (9) Mount the propeller on the engine propeller shaft.
- (10) Make sure the alignment mark on the spinner aft bulkhead and the propeller blade with are in alignment.
- (11) Ensure threads of nuts and studs are free of burrs, nicks, and similar damage, and clean of foreign material.

WARNING: If the lubricant is not applied as required, the nuts will be under torqued, and the propeller could fail.

- (a) For Pratt & Whitney engine installations:

CAUTION: Do not use oil as a substitute for approved lubricant. It is imperative that the correct specification of lubricant be used during installation. Substitution of the approved grease with an unapproved lubricant (or no lubricant) could result in under-torquing or severe over-torquing of propeller attaching parts.

- 1 Lubricate the threads of studs and nuts and the faces of nuts, spacers, or washers with MIL-PRF-83483 (McCauley part number A-1637-16) grease.
- 2 Install mounting nuts on mounting studs.
- 3 Torque the mounting nuts in an alternating sequence to prevent the hub rocking on the engine flange.
- 4 When the hub is seated fully on the engine flange, torque to the specification called out in the mounting decal located on propeller hub at the number 1 socket.

NOTE: If the decal containing the propeller installation instructions is missing or illegible, install a new decal. All Pratt & Whitney engine installations, use a part number A-2230-7 decal.

- 5 After you apply the final torque, apply torque seal to nut and stud threads.
- (b) If required, install the deice leads.
- (12) McCauley Torque Wrench Adapter:

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CAUTION: If an adaptor or extension (such as McCauley part number B-5588) is attached to torque wrench drive end and this adds to its length, then the actual applied torque will be greater than the dial reading. The following formula should be used to find what the dial should read in order to obtain the correct applied torque:

$$\text{Dial Reading} = \frac{\text{Torque Wrench Length} \times \text{Desired Torque}}{\text{Torque Wrench Length} + \text{Extension Length}}$$

- (13) Remove the D-5945 feedback collar retractor tool from the propeller.
- (14) Make sure of proper rigging of engine controls. Refer to aircraft maintenance manual or STC maintenance manual supplement.
 - (a) Feather, reverse, and low blade angles are set during assembly or overhaul. These angles are NOT adjustable in the field.

CAUTION: Do not operate the propeller below the minimum propeller idle speed operating restriction. The minimum propeller idle speed operating restriction is the result of a specific vibratory resonant condition known as "reactionless mode". Ground operation, at or near a reactionless mode vibratory resonance speed, can cause very high stresses in the propeller blades and hubs. These high stresses are more severe when operating in a tailing wind condition. If the propeller is operated within a restricted RPM range or below a minimum RPM restriction for an extended period of time, the propeller blades and hubs may become unairworthy due to fatigue. Hub or blade failure has the potential of causing a catastrophic event due to blade separation. The propeller RPM restriction is often placed below the minimum idle RPM; however, certain aircraft have a restriction that is above the propeller idle RPM setting. Either restriction is important. The propeller operating restrictions or limitations may be found in the Airplane Flight Manual (AFM) or Airplane Flight Manual Supplement (AFMS). The propeller installations may be controlled by the various airframe manufacturers Type Certificate (TC) or by Supplemental Type Certificate (STC).

E. Spinner Installation

CAUTION: Undershimming or overshimming of the spinner aft bulkhead could result in spinner wobble, vibration, and/or bulkhead and spinner cracking. Please follow shimming procedures carefully.

- (1) Install propeller spinner fillets on the bulkhead with screws and washers if required.
- (2) Insert shims into the spinner support and lightly press spinner support onto the cylinder on the front end of the propeller.
- (3) Mount the spinner onto the bulkhead and fillet assembly and check alignment of the mounting holes in the spinner and bulkhead.
 - (a) Make sure that alignment marks on the spinner and propeller blade are matched.
 - (b) Add or subtract shims to the spinner support until spinner mounting holes are aligned within one-half hole with the bulkhead mounting hole diameters while you push hard on the spinner shell.
- (4) Use an awl or a small punch in an adjacent hole to move the spinner screw hole into alignment with the bulkhead hole and install the screw. Repeat the procedure on opposing holes until eight equally spaced screws and washers are installed.

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- (5) Secure the propeller spinner to the bulkhead and fillet assemblies with the remaining screws and washers.

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PROPELLER ADJUSTMENT/TEST

1. Static Balance

- A. Checking and adjusting the propeller static balance shall be accomplished by an FAA approved Part 145 Propeller Repair Station or international equivalent.

2. Propeller Pressure Leakage Check Requirements

- A. Propeller pressure leakage tests of the cylinder and the hub shall be accomplished by an FAA approved Part 145 Propeller Repair Station or international equivalent.

3. Ground Support Equipment

- A. The following special equipment is required for field maintenance of McCauley propellers.

| NAME | PART NUMBER | MANUFACTURER | USE |
|--|-------------|------------------------|---|
| Propeller protractor | | Commercially available | To measure blade angles on 600, 650, and 1100 Series propellers. |
| Start lock release tools | B-5021 | McCauley | To release start locks on C600, C650, and C1100 series propellers. |
| Beta tube installation and adjustment tool | B-5378 | McCauley | To install and adjust beta tube on C600, C650, and C1100 series propellers. |

4. Flight Idle Blade Angle/Flight Idle Torque Checking and Adjustment Procedures (Turbine Series Propellers)

- A. Flight Idle Blade Angle Checking and Adjustment Procedure
- (1) Check the blade angles are within the limits specified in the FAA Aircraft Type Certificate Data Sheets or STC.
 - (2) The adjustment of the flight idle blade angle or flight idle torque is in accordance with the airplane maintenance instructions or STC instructions.
 - (a) Make sure the propeller blade angles or flight angle torque are within the limits specified in the FAA Aircraft Type Certificate Data Sheets or STC.

NOTE: Transient operation below the minimum RPM limitation is permitted during feathering and unfeathering cycles.

5. Dynamic Balance

NOTE: Some aircraft manufacturers do not approve dynamic balance of the propeller because of potential crack damage to spinner bulkhead from the installed weight.

- A. Refer to Propeller Maintenance Practices, Dynamic Balance for instructions to dynamically balance the installed propeller.

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PROPELLER INSPECTION/CHECK

1. Limitations

- A. Operational and service personnel should be familiar with the following limitations during any inspection.
- B. Corrosion. Other than small areas of light surface corrosion with no evidence of pitting, the presence of corrosion may require propeller removal and reconditioning by an appropriately rated repair facility. Intergranular corrosion may be present when the corrosion protective coatings (paint, anodize, etc.) have been lost. Corrosion pitting should be removed as described in the overhaul manual and applicable ADs.
- C. Unauthorized Straightening of Blades.
 - (1) A bent propeller cannot be straightened without special processing in an FAA approved Part 145 Propeller Repair Station or international equivalent because bending may harden the aluminum and lead to catastrophic blade failure.
 - (2) All blades showing evidence of unapproved repairs require removal of the entire propeller and proper assessment by an FAA approved Part 145 Propeller Repair Station or international equivalent.
 - (3) Sighting along the leading edge of a propeller blade for any signs of bending can also provide evidence of unapproved blade straightening.
 - (4) Any deformation of the flat portion such as bows or kinks may indicate previous unauthorized straightening of the blade.
 - (5) Careful visual inspection of the leading edges and the flat-faced portion of the blade may sometimes detect unapproved repairs.
 - (6) Blades should also be examined for any discoloration that would indicate unauthorized heating.
 - (a) Aluminum blades that have been heated for any repair must be removed from service since only cold (room temperature) straightening by an FAA approved Part 145 Propeller Repair Station or international equivalent repair facility is authorized.
 - (7) Field service personnel should never straighten bent propellers to facilitate shipping when the propellers are being sent to a repair facility for inspection and repair. This procedure can conceal important information related to the severity of the damage.
- D. Blade Shortening.
 - (1) Propeller tip damage will sometimes lead field maintenance personnel to consider removing damaged material from the blade tips. However, propellers are certified to the aircraft engine and airframe resonant frequency by being manufactured with a particular diameter to minimize vibration. Shortening of the blades without reference to approved data could create an unairworthy condition. Refer to the airplane type certificate data sheet, aircraft specification sheet, or supplemental type certificate data sheet as applicable, for the allowable propeller diameter for each propeller installation.
 - (2) With certain limitations, specific minor repairs may be accomplished.
 - (a) If the blade tip has been damaged and the removal of the damaged area would result in shortening of the propeller blade(s), the propeller shall be taken to an FAA approved Part 145 Propeller Repair Station or international equivalent, for propeller blade repair.
 - (b) When conditions indicate, inspect the blade tips for evidence of shortening and, if necessary, measure the propeller diameter to determine if an unauthorized repair has altered it.

2. Definitions of Defects and Damage

- A. Brinelling is the occurrence of shallow, spherical depressions in a surface, usually produced by a part having a small radius in contact with the surface under high load.
- B. A Burr is a small, thin section of metal which extends beyond the edge of a regular surface and usually is located on a corner of, or on the edge of, a bore or hole.
- C. Corrosion is the loss of surface metal by a chemical or electrochemical action, and the resulting product (for example, iron rust) usually can be removed mechanically.

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- D. A Crack is an irregularly shaped separation within a material at a location of excessive stress and usually is visible as a thin line across the surface of the material.
- E. A Cut is a mechanical loss of metal (e.g., by saw blade, chisel, or glancing blow of a sharp-edge stone), usually extending to a significant depth over a relatively long, narrow area.
- F. A Dent is a depression in a metal surface caused by an object striking the surface with force.

NOTE: The surface around the dent usually will be slightly deformed.

- G. Distortion or bending is the alteration of a component's original size or shape.
- H. Erosion is the gradual wearing away or deterioration of a material due to action of the elements.
- I. Exposure is leaving a material open to action of the elements.
- J. Fretting is the occurrence of shallow, spherical surface depressions, usually caused by vibratory ("chattering") action or by a part which has a small radius in contact under high load with the material.
- K. Galling (or burnishing) is the breakdown (or buildup) of a metal surface resulting from excessive friction between two moving parts.

NOTE: Particles of the softer metal tear loose (breakdown) and weld to the surface of the harder metal (buildup).

- L. A Gouge is a small surface area where material has been removed by contact with a sharp object.
- M. Impact damage occurs either in-flight or on the ground when a propeller blade or hub assembly strikes or is struck by an object.
- N. An Inclusion is the presence of an unspecified material that was introduced into a portion of stock metal during manufacturing processes such as rolling or forging.
- O. A Nick is a localized break or edge notch, usually with displacement of (rather than loss of) metal.
- P. Pitting is seen as a number of extremely small (possibly deep) gouges, usually with defined edges, caused by wear and/or deterioration on the surface of a material.
- Q. A Score is deeper than a gouge and may show discoloration from the temperature produced by friction from contact under pressure.
- R. A Scratch is an elongated Gouge.
- S. A Stain is a localized color change noticeably different from the surrounding surface area.

3. Daily or Preflight Inspection

- A. Oil and Grease Leakage.
 - (1) Look for red oil or engine lubricant leaks in unusual places, like the outside surfaces and seals.
 - (2) Oil or grease leakage may be due to a seal failure or a crack in the hub or blade.
 - (a) The source of the oil or grease leak should be determined before flight.
 - (b) During maintenance, wipe the surfaces of the propeller after this inspection, not before, since oil leaking from a crack may assist in detecting it.
 - (c) Red oil gives a positive warning of a crack in the hub or a damaged seal.
- B. Blade inspection
 - (1) Wash the blades with a mild soap and water solution to remove all residue.

CAUTION: Do not use solvents to clean the blades.

- (a) Do not power wash as water may be forced past the O-rings. Water inside the hub will cause corrosion and may cause propeller failure.
- (b) Make sure the blade that you are cleaning is pointing down.
- (c) Do not spray into the blade retention area because water may be forced into the hub.

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- (2) Surface Damage.
 - (a) Look for surface damage on both sides of the blades such as dents, nicks, scratches, and corrosion.
 - (b) Surface imperfections can also be felt by running your fingernail along the blade leading edge. Damage should be repaired before flight.
 - (c) Whenever a noticeable dent, nick, corrosion pit, or bump is observed, an appropriately rated mechanic should blend it out.
 - (d) The mechanic should remove all corrosion products and make sure that the section thickness has not been reduced below allowable limits.
- (3) Erosion
 - (a) Examine the blade for evidence of erosion.
 - 1 If blades appear to show erosion beyond limits, the propeller should be removed from service and evaluated by an appropriately rated propeller repair facility.
 - 2 Measure the area of the blade with the most erosion damage.
 - a Damage that is located on the leading or trailing edges must not exceed 0.094 inch (2.39 mm) in depth.
 - b Damage that is located on a repairable area of the face or camber side of the blade must not exceed 0.061 inch (1.55 mm) in depth.
 - 3 Erosion damage beyond these limits is not field repairable and the propeller should be removed from service and evaluated by an FAA approved Part 145 Propeller Repair Station or international equivalent repair facility.
 - (b) Check the condition of the paint on blades and spinners that have protective paint.
 - 1 Paint protects the surface of the blade from erosion. The blade should be repaired before the paint wears through and the blade structure begins to erode.
 - 2 Do not apply excessive paint and do not paint propeller components unless it is in accordance with McCauley instructions since improper painting may affect propeller balance, operation, static electricity discharge, or have other unintended consequences.
- (4) Straightness
 - (a) Sight down the edges to find any deformation.
- (5) Looseness
 - (a) Feel the blades and move them to find unusual changes in looseness and unusual play.
 - 1 Blade-to-blade differences indicate that an internal problem may exist.
- C. Spinner and Bulkhead.
 - (1) Externally check the spinner and bulkhead for security, missing fasteners, damage, and cracks. Cracks typically originate from the attachment screws.
 - (a) Repair of cracks is not permitted.
 - (2) Check for looseness of the bulkhead. This could be an indication that the mounting bolts are loose.
 - (3) Wear depth on the inside of the spinner must not exceed 0.010 inch (0.25 mm).

NOTE: Wear inside the spinner can be caused by improper shimming of the spinner or by deice leads rubbing.
- D. General Condition.
- E. Control System.
 - (1) The control system (governor) should be checked to determine whether the system is operating properly and is not leaking.
- F. Maintenance Records.
 - (1) Note any indications in the logbook for future reference to determine whether a condition is getting worse.

4. 100 Hour and Annual Inspection

- A. At each 100 hours, Annual, or other approved inspection interval, examine the propeller in accordance with aircraft inspection manual. Inspection should include:
 - (1) Spinner Removal

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- (2) Inspection of all attaching hardware, including the hardware under the spinner, for security. Tighten if necessary.
- (3) Check entire propeller for corrosion, cracks, or other damage. Contact a McCauley Service Center for disposition if any unusual damage is found.
- (4) Inspect entire propeller system for oil leakage. If leakage is confirmed, the propeller should be removed, thoroughly inspected, and resealed by an FAA approved Part 145 Propeller Repair Station or international equivalent or technician.
- (5) Repaint propeller blades, as necessary, in accordance with the instructions in Cleaning/Painting/Protective Treatments.
- (6) Examine all placards for legibility and security of installation. Replace all placards that are illegible or not secure.

5. Time Between Propeller Overhaul

- A. The following pages show McCauley's mandatory specified time between overhaul for propellers. These specifications are based on hours of operation and calendar time, whichever occurs first. The starting point for the calendar limit is the date of first installation on an engine (not from date of manufacture or overhaul). Date of manufacture or overhaul is applicable when determining long term storage inspections. If the propeller has been removed from service, the TBO calendar limit still applies, not long term storage.

NOTE: Calendar month is the period of time from the first day of a month to the last day of the month. When the term calendar month is used, compliance can be achieved at any time during the month, up to and including the last day of the month. For Example: a propeller with a 60 calendar month inspection interval is inspected and approved upon any given day of the month. This propeller will become due for inspection upon the last day of the same month, 60 months later.

- B. All deviations from published TBOs must be approved by your local Regulatory Authority with a recommendation from McCauley.
- C. If the propeller is in storage in excess of two years, additional inspections are required. Once installed on an aircraft, the propeller calendar limit is not interrupted by subsequent removal and/or storage.
- D. Propeller overhaul should, as much as practical, coincide with engine overhaul. For example, in a case where propeller TBO is 1500 hours and engine TBO is 1400 hours, the propeller should be overhauled at the same time as the engine. This is appropriate as long as neither TBO limit is exceeded.

CAUTION: Review applicable FAA Airworthiness Directives or McCauley Service Bulletins. These may require compliance prior to TBO.

- E. TBO specifications are based on normal aircraft with normal and continuous usage. Flight time and calendar limit must not be the only factors considered in determining when a propeller needs to be overhauled. Factors such as operating conditions or environment often demand that a propeller, governor, or accumulator be overhauled prior to TBO. Even though a propeller, governor, or accumulator may be operating normally and have a good external appearance when the TBO flight time or calendar limit is reached, operation beyond the specified TBO limits is not permitted.
- F. Propeller Models
- (1) The propeller model designation is impression stamped on the propeller hub. Change letters are frequently stamped at the end of the model designation (e.g. 3A32C406-AD). These letters indicate engineering changes and/or previous overhaul modifications. In Table 1, unless specific change letters are shown, the overhaul frequency note applies to all propellers of that model, regardless of change letters. Use the highest letter stamped after hub model number to determine frequency of overhaul. Refer to Tale 601.

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Example : Propeller model 3A32C406-AD

'D' is the highest letter = TBO note T. applies

Propeller model 3A32C406-B

'B' is the highest letter = TBO note S. applies

Table 601. Table 1: Propeller Models

| Model Designation | Overhaul Frequency Note | Model Designation | Overhaul Frequency Note | Model Designation | Overhaul Frequency Note |
|------------------------|-------------------------|------------------------|-------------------------|-----------------------|-------------------------|
| 2A34C201-less than C | C. | 2A34C201-C or higher | E. | 2D34C202 | D. |
| 2A34C203-less than C | D. | 2A34C203-C or higher | E. | C2A34C204-less than C | D. |
| C2A34C204-C or higher | E. | B2A34C205 | A. | B2D34C206 | D. |
| B2D34C207 | D. | B2D34C208 | D. | 2A34C209-less than C | D. |
| 2A34C209-C or higher | E. | 2A34C210 | D. | B2D34C211 | D. |
| B2D34C212 | D. | B2D34C213 | D. | B2D34C214 | D. |
| 2D34C215 | D. | 2A34C216 | D. | B2D34C217 | D. |
| B2D34C218 | D. | B2D34C219 | D. | B2D34C220 | D. |
| 2A34C221 | D. | 2A37C223-less than C | C. | 2A37C223-C or higher | E. |
| B2D37C224 | D. | B2A34C225 | D. | 2A34C227-less than C | D. |
| 2A34C227-C or higher | E. | B2A37C228 | A. | B2D37C229 | D. |
| D2A37C230 | E. | D2A37C231 | E. | 2A37C232 | E. |
| E2A37C233 | E. | E2A37C234 | E. | B2D34C235 | E. |
| C2D37C236 | E. | B2A37C238 | E. | 2A34C239 | E. |
| 2A34C240 | D. | 2A34C241 | E. | D2AF34C301 | D. |
| D2AF34C302 | D. | D2AF34C303 | D. | D2AF34C304 | D. |
| D2AF34C305-less than B | A. | D2AF34C305-B or higher | D. | D2AF34C306 | D. |
| D2AF34C307 | D. | D2AF34C308 | D. | D2AF34C310 | D. |
| D3A34C401 | D. | D3A34C402 | D. | D3A34C403 | D. |
| D3A34C404 | D. | B3D34C405 | D. | 3A32C406-less than D | S. |
| 3A32C406-D or higher | T. | B3D32C407 | D. | D3A32C408 | A. |

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Table 601. Table 1: Propeller Models (continued)

| Model Designation | Overhaul Frequency Note | Model Designation | Overhaul Frequency Note | Model Designation | Overhaul Frequency Note |
|-----------------------|-------------------------|-----------------------|-------------------------|----------------------|-------------------------|
| D3A32C409-less than D | S. | D3A32C409-D or higher | T. | D3A36C410 | D. |
| D3A32C411 | D. | B3D32C412 | D. | B3D34C413 | D. |
| B3D32C414 | D. | C3D36C415 | D. | B3D36C416 | D. |
| B3D32C417 | D. | 3A32C418 | D. | B3D32C419 | D. |
| D3A34C420-less than D | D. | D3A34C420-D or higher | E. | B3D34C421 | D. |
| 3A34C422 | D. | 3A34C423-less than D | D. | 3A34C423-D or higher | E. |
| B3D36C424 | D. | B3D36C427 | D. | B3D36C428 | D. |
| B3D36C429 | D. | D3A36C430 | E. | B3D36C431 | E. |
| B3D36C432 | E. | B3D36C433 | E. | 3A36C434 | E. |
| D3A36C435 | E. | D3A36C436 | E. | B3D36C442 | E. |
| D3A34C443 | E. | D3A34C444 | E. | D3A34C447 | E. |
| 3FF32C501 | D. | 3AF34C502 | D. | 3AF34C503 | D. |
| 3AF32C504 | D. | 3AF32C505 | D. | 3AF32C506 | D. |
| 3AF32C507 | D. | 3AF32C508 | D. | 3AF32C509 | D. |
| 3AF37C510 | D. | 3AF32C511 | D. | 3AF32C512 | D. |
| 3AF36C514 | D. | 3AF32C515 | D. | 3AF37C516 | D. |
| 3AF32C521 | D. | 3AF32C522 | D. | 3AF32C523 | D. |
| 3AF32C524 | F. | 3AF32C525 | D. | B3DF36C526 | F. |
| B3DF36C527 | F. | 3AF32C528 | F. | 3FF34C529 | V. |
| 3GFR34C601 | G. | 3GFR34C602 | G. | 4HFR34C652 | H. |
| 4HFR34C653 | O. | 4HFR34C661 | H. | 4HFR34C662 | H. |
| 4HFR34C663 | L. | 4HFR34C664 | H. | 4HFR34C665 | K. |
| 3GFR34C701 | G. | 3GFR34C702 | G. | 3GFR34C703 | I. |
| 3GFR34C704 | G. | 4HFR34C754 | G. | 4JFR34C758 | G. |
| 4HFR34C762 | G. | 4HFR34C763 | G. | 4HFR34C764 | H. |
| 4HFR34C766 | G. | 4HFR34C768 | H. | 4HFR34C769 | H. |
| 4HFR34C771 | H. | 4HFR34C773 | H. | 4HFR34C774 | G. |
| 4HFR34C775 | I. | 5JFR36C1003 | F. | 5HFR34C1008 | H. |

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Table 601. Table 1: Propeller Models (continued)

| Model Designation | Overhaul Frequency Note | Model Designation | Overhaul Frequency Note | Model Designation | Overhaul Frequency Note |
|------------------------|-------------------------|-------------------------|-------------------------|----------------------------|-------------------------|
| B5JFR36C1101 | M. | C5JFR36C1102 | M. | B5JFR36C1103 | N. |
| C5JFR36C1104 | N. | 5HFR34C1105 | H. | | |
| Fixed Pitch Propellers | P. | All Propeller Governors | Q. | All Propeller Accumulators | R. |

NOTE

- A. 1200 hours or 60 calendar months, whichever occurs first.
- B. 1000 hours or 60 calendar months, whichever occurs first.
- C. 1500 hours or 60 calendar months, whichever occurs first, except:
 - Agricultural aircraft installations - the overhaul frequency is 1200 hours or 60 calendar months, whichever occurs first.
- D. 2000 hours or 72 calendar months, whichever occurs first, except:
 - Agricultural aircraft installations - the overhaul frequency is 1200 hours or 60 calendar months, whichever occurs first.
 - Aerobatic installations - the overhaul frequency is 1000 hours or 72 calendar months, whichever occurs first.
- E. 2400 hours or 72 calendar months, whichever occurs first.
- F. 3000 hours or 72 calendar months, whichever occurs first.
- G. 3500 hours or 72 calendar months, whichever occurs first.
- H. 5000 hours or 72 calendar months, whichever occurs first.
- I. 4000 hours or 72 calendar months, whichever occurs first.
- J. 2000 hours or 72 calendar months, whichever occurs first.
- K. 5000 hours or 72 calendar months, whichever occurs first. 10,000 hour life limit on propeller blades and hub.
- L. 5000 hours or 72 calendar months, whichever occurs first. 16,000 hour life limit on propeller blades.
- M. 6000 hours or 60 calendar months, whichever occurs first.
 - The hub assembly of any B5JFR36C1101 or C5JFR36C1102 propeller that has never operated on a water-methanol assist Jetstream 4100 aircraft -- Replace 6,000 hours
 - The hub assembly of any B5JFR36C1101 or C5JFR36C1102 propeller that is operating on, or has ever operated on, a water-methanol assist Jetstream 4100 aircraft -- Replace 6000 hours
 - All 114GCA-0 and L114GCA-0, blades are life limited at 3,500 hours.
- N. 5000 hours or 60 calendar months, whichever occurs first.
 - The hub assembly of any B5JFR36C1103 or C5JFR36C1104 propeller that has never operated on a water-methanol assist Jetstream 4100 aircraft -- Replace 6,000 hours
 - The hub assembly of any B5JFR36C1103 or C5JFR36C1104 propeller that is operating on, or has ever operated on, a water-methanol assist Jetstream 4100 aircraft -- Replace 6000 hours
 - All 114HCA-0 and L114HCA-0 propeller blades are life limited at 3,500 hours.

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- O. *5000 hours or 72 calendar months, whichever occurs first.*
- Agricultural aircraft installations - the overhaul frequency is 2000 hours or 60 calendar months, whichever occurs first.
 - Only for L106FA-0 propeller blades used in the 4HFR34C653 propeller assemblies or blades that have been installed on Jetstream Series 3200 aircraft or history unknown; Propeller blades without change letter "A" must be retired from service before December 1, 2001 or upon reaching 2400 flight hours after August 1, 2000 or 16,000 hours time since new, whichever occurs first. Blades with change letter "A" are life limited to 16,000 hours.
- P. *Fixed pitch propellers - 2000 hours or 72 calendar months which ever occurs first**. Additionally, the propeller mounting bolt torque should be checked at least once per year. Propeller mounting bolts must be magnetic particle inspected in accordance with ASTM E-1444 or liquid penetrant inspected in accordance with ASTM E-1417 or replaced at every overhaul. Propeller mounting bolts must be replaced whenever the propeller is involved in a blade strike as defined in Necessary Actions Following Object Strike of Stationary Propeller, Blade Strike of Rotating Propeller, Bird Strike, or Sudden Engine Stoppage.
- *For 1A170E/JHA[XXXX] propellers only, installed on Aircraft Operating as Pilot Schools in accordance with 14 CFR, Part 141, and all aircraft with 2000 or more cycles for every 1000 flight hours must be inspected in accordance with Service Bulletin 240[X] every 1000 hours or 72 calendar months whichever occurs first.
 - *For 1A103/TCM[XXXX] propellers only, the overhaul frequency is every 1500 hours of operation or 72 calendar months, whichever occurs first. All propellers with 1500 or more hours total time in service must be inspected in accordance with Alert Service Bulletin 221[X] every 750 hours of operation or 36 calendar months whichever occurs first.
- Q. *All Propeller Governors - 2000 hours or 60 calendar months, whichever occurs first.*
- R. *All Propeller Accumulators - 1800 hours or 60 calendar months, whichever occurs first.*
- S. *2000 hours or 72 calendar months, 10,000 hour life limit on blades and hub, except:*
- Aerobatic installations - the overhaul frequency is 1000 hours or 72 calendar months, whichever occurs first. 10,000 hour life limit on blades and hub.
- T. *2400 hours or 72 calendar months, whichever occurs first. 10,000 hour life limit on blades and hub, except:*
- Aerobatic installations - the overhaul frequency is 1500 hours or 72 calendar months, whichever occurs first. 10,000 hour life limit on blades and hub.
- U. For 4HFR34C755 propellers, comply with McCauley Service Bulletin 175, Converting Propeller Model 4HFR34C755 to a 4HFR34C754, then use the overhaul frequency for a 4HFR34C754 propeller.
- V. *3000 hours or 72 calendar months, whichever occurs first, except;*
- Agricultural aircraft installations - the overhaul frequency is 1200 hours or 60 calendar months, whichever occurs first.

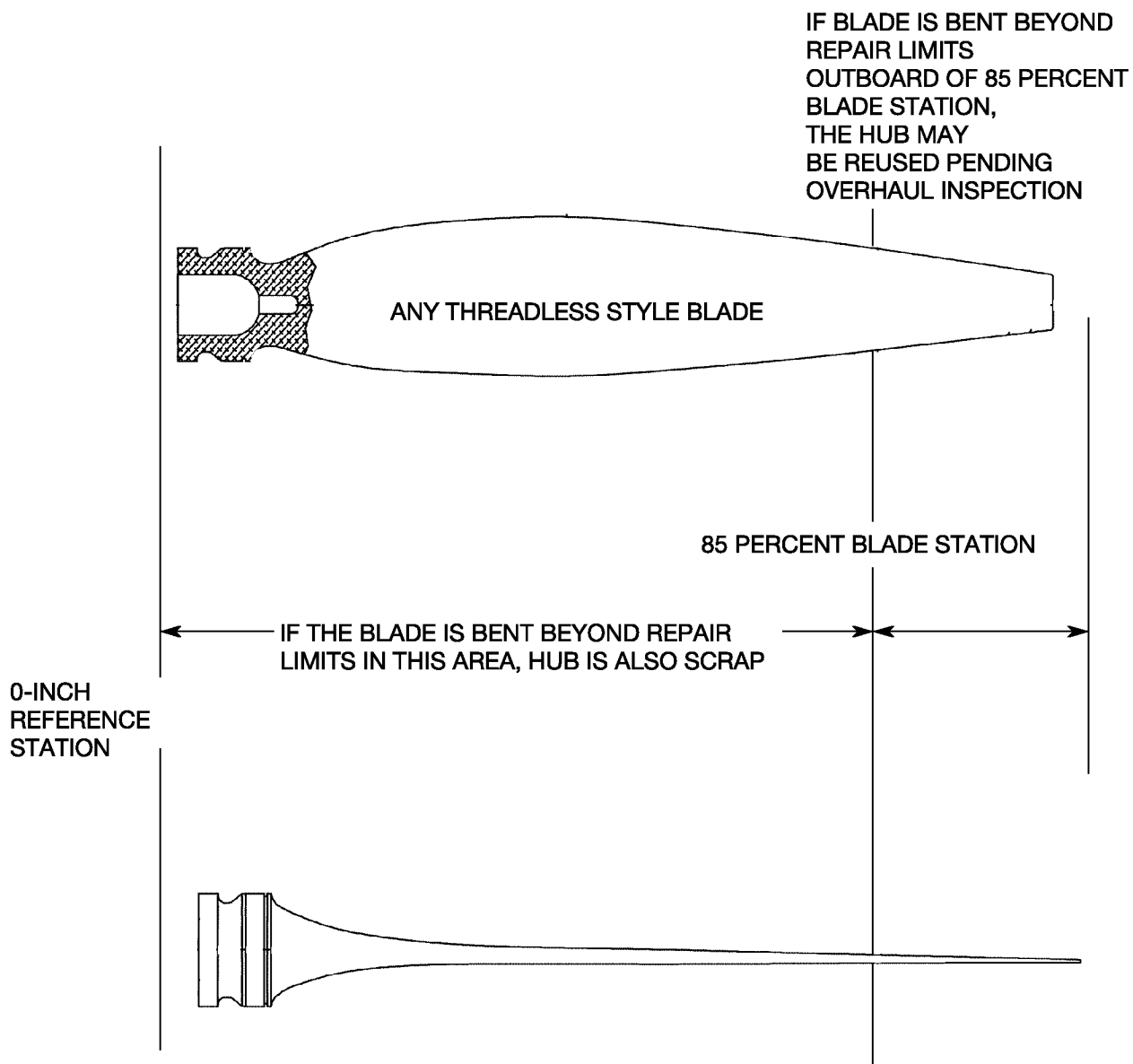
6. Necessary Actions Following Object Strike of Stationary Propeller, Blade Strike of Rotating Propeller, Bird Strike, or Sudden Engine Stoppage

- A. Propellers with Blades Bent Beyond Repair
- (1) A hub must be declared unairworthy and scrapped if any blade in the propeller assembly is bent beyond repair limits within the first 85% of the blade radius, refer to Figure 601.
- B. Object Strike of Stationary Propeller
- (1) "Object Strike" is defined as any impact of a non-rotating propeller by a substantial moving object, such as any personnel vehicle, aircraft tug, ground power unit, or similar.

NOTE: The definition is intended for use as an example only. Determination as to whether or not an object strike actually occurred is ultimately the responsibility of the aircraft operator.

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NOTE: THE 85 PERCENT BLADE STATION VALUE IS WITH RESPECT TO THE BASIC DESIGN LENGTH OF A BLADE, NOT THE CUT DOWN LENGTH.

Location of Blade Damage
Figure 601 (Sheet 1)

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- (2) Inspect all blades for damage such as scrapes, gouges, etc. caused by the impact. Any damage beyond normal field repair limits, refer to Blade Repair for field repair limits, is cause for propeller removal and repair as defined below.
- (3) Check the blade track and verify that all blades measure within the following limits:
 - (a) 0.0625 inch (1.6mm) of each other on piston engine propellers.
 - (b) 0.170 inch (4.3mm) of each other on turbine engine propellers (except propeller models C1101 through C1104).
 - (c) 0.1875 inch (4.7mm) of each other on C1101 through C1104 models.
- (4) Check blade twist. All blades in a propeller should have the same amount of "rotational play". If the difference in rotational play between two blades is beyond 1.0 degree, uneven internal wear or damage is the possible cause.
 - (a) For example, rotational movement of No. 1 blade measures 1.2 degrees and No. 2 blade measures 2.3 degrees. This would be considered excessive since the difference is more than 1.0 degree. This check must be performed every 10 hours for the next 20 hours. If no change is seen after 20 hours, inspections may be discontinued.

NOTE: The results of an object strike inspection should be noted in the propeller log book and, if required, note when the next inspection is due.

- (5) If any propeller blade is damaged beyond field repair limits, the blade track or the propeller blade twist is beyond the limits, contact McCauley for disposition of the propeller assembly.

C. Blade Strike of Rotating Propeller

- (1) "Blade Strike", sometimes referred to as "Ground Strike", is defined as any impact or suspected impact of the rotating propeller upon such items as, but not limited to, the ground, tow bars, landing lights, carts, snow banks, hedges, etc. Please note that this definition is intended for use as an example only. Determination as to whether or not a blade strike actually occurred is ultimately the responsibility of the aircraft operator.

CAUTION: Internal damage can occur without evidence of gross external damage.

- (a) Any McCauley propeller experiencing a blade strike must be removed from the aircraft and overhauled by an FAA approved Part 145 Propeller Repair Station or international equivalent in accordance with the applicable overhaul manual. A hub must be declared unairworthy and scrapped if any blade in the propeller assembly is bent beyond repair limits.
- (2) Bird Strike
 - (a) "Bird Strike" can be defined as the impact of any bird into the rotating propeller causing damage.
 - (b) Inspect all blades for damage such as scrapes, gouges, etc. caused by the impact. Any damage beyond normal field repair limits is cause for propeller removal and repair. Refer to Blade Repair for field repair limits.
 - (c) Check the blade track and verify that all blades measure within the following limits:
 - 1 0.0625 inch (1.6mm) of each other on piston engine propellers.
 - 2 0.170 inch (4.3mm) of each other on turbine engine propellers (except propeller models C1101 through C1104).
 - 3 0.1875 inch (4.7mm) of each other on C1101 through C1104 models.
 - (d) Check blade twist. All blades in a propeller should have the same amount of "rotational play". If the difference in rotational play between two blades is beyond 1.0 degree, uneven internal wear or damage is the possible cause.
 - 1 (For example, rotational movement of No. 1 blade measures 1.2 degrees and No. 2 blade measures 2.3 degrees. This would be considered excessive since the difference is more than 1.0 degree.)

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- 2 This check must be performed every 10 hours for the next 20 hours after a bird strike. If no change is seen after 20 hours, inspections may be discontinued.

NOTE: The results of a bird strike inspection should be noted in the propeller log book and, if required, note when the next inspection is due.

- (e) If any propeller blade is damaged beyond field repair limits, the blade track or the propeller blade twist is beyond the limits, the propeller must be removed from the airplane and taken to and overhauled by an FAA approved Part 145 Propeller Repair Station or international equivalent.
- (3) Sudden Engine Stoppage
 - (a) "Sudden Stoppage" is defined as any propeller experiencing a sudden decrease in RPM. This is commonly due to engine failure or seizure. Please note, determination as to whether or not sudden engine stoppage has occurred is ultimately the responsibility of the aircraft operator. McCauley recommends consulting engine manufacturer's data to determine criteria for sudden engine stoppage.
 - (b) Any McCauley propeller experiencing a sudden stoppage must be removed from the aircraft and overhauled by an FAA approved Part 145 Propeller Repair Station or international equivalent in accordance with the applicable propeller overhaul manual.

7. Governors Exposed to Propeller Blade Strike, Propeller/Engine Lightning Strike, Engine Detonation, Oil Contamination, or Sudden Engine Stoppage

- A. Compliance: Any governor exposed to propeller blade strike, propeller and/or engine lightning strike, oil contamination, engine detonation, or sudden engine stoppage must not be returned to service as is. It must be repaired or overhauled as defined in Governor Inspection Criteria that follow.
- B. Definitions
 - (1) "Propeller Blade Strike", sometimes referred to as "Ground Strike", is defined as any impact or suspected impact of the rotating propeller upon such items as, but not limited to, the ground, tow bars, landing lights, carts, snow banks, hedges, etc. Please note that the above definition is intended for use as an example only. Determination as to whether or not a blade strike actually occurred is ultimately the responsibility of the aircraft operator.

CAUTION: Internal damage can occur without evidence of gross external damage.

- (a) Any governor mounted to an aircraft involved in a propeller ground strike must comply with Governor Inspection Criteria.
- (2) Propeller/Engine Lightning Strike: Definition of propeller lightning strike can be found in Lightning Strike Inspection Requirements. Refer to engine manufacturers' service information for definition of engine lightning strike. Any governor showing signs of arcing or pitting due to electrical discharge, mounted on an aircraft exposed to engine or propeller lightning strike as defined in these documents must comply with Governor Inspection Criteria.
- (3) Engine Detonation: Refer to engine manufacturers' service information for determination of engine detonation. Exposure to detonation may impart severe stresses to the governor's rotating parts. Any governor operated under the above conditions must comply with Governor Inspection Criteria.

NOTE: Special attention should be paid to engines exposed to fuel contamination which may have changed the fuel octane rating which could cause engine detonation.

- (4) Engine Oil Contamination: Refer to engine manufacturers' service information for determination of oil contamination. Any governor mounted to an engine which required servicing to remove oil contamination must comply with Governor Inspection Criteria.
- (5) Sudden Engine Stoppage: Refer to engine manufacturer's service information for determination of sudden engine stoppage. Any governor mounted to an aircraft involved in a sudden engine stoppage must comply with Governor Inspection Criteria.

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C. Governor Inspection Criteria:

- (1) Any governor affected by Compliance above, must perform the following steps:
 - (a) The governor must be tagged that it was involved in such an incident for the information of the overhauling agency.
 - (b) The governor must be overhauled by an authorized McCauley service facility in accordance with McCauley Service Manual 780401.
 - (c) During the overhaul, the service facility must pay particular attention to the following procedures:
 - 1 Perform magnetic particle inspection on flyweight assembly components, idler gear, and drive gear according to instructions in manual.
 - 2 Carefully examine all rotating parts for signs of cracks or other damage.
 - 3 Pay special attention to governor parts involved in a lightning strike. Look closely for signs of burning or metal flow. Any parts showing burns or metal flow must be scrapped and replaced.
 - (d) If parts pass inspection and are found to be acceptable, governor may be reassembled, tested, and returned to service.
 - (e) If parts do not pass inspection, replace damaged parts before governor is reassembled, tested, and returned to service.
 - (f) Record a clear entry in the appropriate airframe and/or engine logbook indicating inspection/repair of the governor per this manual.

8. Blade Track Check

A. Check

- (1) Turn propeller so that Number 1 blade is straight down.
- (2) Position a smooth board beneath the blade tip.
- (3) Block up the board firmly in place just clear of the blade tip.
- (4) Place a pencil mark approximately one inch (25 mm) long on the board at the midpoint of the outer edge of Number 1 blade tip.
- (5) Turn the propeller so next blade is straight down.
- (6) Place a thin one-inch (25 mm) line on the board at the midpoint of the outer edge of the second blade tip.
- (7) Carefully turn propeller, and repeat tracking measurement for each blade.
- (8) Each time a line is added, measure the horizontal difference between the lines farthest apart.
 - (a) For propellers installed on piston engines, all blades must measure within 0.0625 inch (1.6 mm) of each other.
 - (b) For C1101 through C1104 models propellers installed on turbine engines, all blades must measure within 0.1875 inch (4.7 mm) of each other.
 - (c) For all propellers installed on turbine engines except C1101 through C1104 model propellers, all blades must measure within 0.170 inch (4.3 mm) of each other.
- (9) If blade track difference exceeds the allowable limits, remove the propeller and have the propeller face alignment checked by an authorized McCauley service facility.

9. Lightning Strike Inspection Requirements

- A. If doubt exists as to the occurrence of a lightning strike, the following criteria can be used to verify any suspicion:
- (1) Check for burns or signs of arcing on blades and hub.
 - (2) Using a magnetism detector, check all exposed steel areas of propeller for magnetism. A positive magnetic indication suggests the propeller was struck by lightning.

NOTE: Any accepted industry standard magnetic detection device is permitted to be used to test for magnetism in the exposed steel parts of the propeller.

- (3) Look for any signs of localized melting or metal flow, particularly on blades.
- (4) If preliminary inspection suggests an actual strike, a complete propeller overhaul is to be accomplished in accordance with the applicable McCauley overhaul manual by an authorized McCauley overhaul facility.

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10. Propeller Overspeed Inspection Requirements

A. The following are inspection criteria for McCauley propellers involved in an overspeed condition.

| | Percentage Overspeed | Action to be Taken |
|---|--------------------------------|---|
| All Propellers on Reciprocating Engines | Up to, but not including 15% | General external visual inspection. No further action required. |
| | 15% or Higher | Contact McCauley Product Support for disposition. |
| All Propellers on Turbine Engines except C1101, C1102, C1103, and C1104 | Up to, but not including 10% | General external visual inspection. No further action required. |
| | 10% or Higher | Contact McCauley Product Support for disposition. |
| C1101, C1102, C1103, and C1104 | Up to, and including 6 percent | Up to 5 minutes operation is permitted. Operation beyond 5 minutes may require some inspection. Contact McCauley Product Support for disposition. |
| | Above 6 percent | Teardown inspection is required. This inspection can only be accomplished by an authorized McCauley service facility. Record all details of the overspeed event and contact McCauley Product Support for disposition. |

11. Propeller Overtorque Inspection Requirements

A. The following are inspection criteria for McCauley model C1101, C1102, C1103, and C1104 propellers involved in an overtorque condition.

NOTE: This overtorque limitation/inspection only applies to model C1101 thru C1104 propellers.

- (1) Engine Overtorque up to and including 101 percent - maximum continuous operation permitted.
- (2) Engine overtorque of between 102 percent to 110 percent is permissible for up to 30 seconds duration, provided no condition in section 3 also occurs.
- (3) McCauley should be contacted and given exact operating conditions for determination of corrective action for engine overtorque during one or more of the following conditions:
 - (a) 111 percent torque or higher.
 - (b) Overtorque during ground operations.
 - (c) In-flight overtorque of between 102 percent and 110 percent for more than 30 seconds
 - (d) Overtorque of between 102 percent and 110 percent for less than 30 seconds under the following:
 - 1 Banked turns of more than 45 degrees.
 - 2 Yaw of more than or equal to 2/3 ball as indicated by the airplane turn and bank indicator or similar instrument.
 - (e) Any overtorque condition outside the above criteria.

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12. Normal Criteria for Static Blade Shake and Twist of All Variable Pitch Propellers

A. **BLADE SHAKE:** Blade shake is defined as follows:

- (1) The tendency for the propeller blades to wobble slightly when the tip is physically moved by hand (lead edge to trail edge; (Refer to Figure 602) is known as blade shake.
 - (a) This tendency is a natural result of the fabrication of parts within the McCauley retention system. While accumulation of tolerances is measured in thousandths of an inch, it must be remembered that both the parts causing blade shake, and the pivot point about which the blade rotates, are near the blade root. As a result, very small differences at the blade root will be magnified many times when measured at the tip.
 - 1 Total maximum allowable movement up to 0.125 inch (3.13 mm) is considered normal.
 - 2 C1100 series propellers may have a maximum movement of 0.1875 inch (4.7 mm).
- (2) Normal blade shake (less than maximum allowable movement) is no cause for concern, as it disappears during propeller rotation due to the high centrifugal forces acting on the blades (20,000 to 45,000 pounds. (89,000 to 200,000 N)).
 - (a) If blade shake exceeds maximum movement allowable, it should be reduced, when convenient, by inserting shims in the blade assembly by an authorized McCauley overhaul facility.

B. **BLADE TWIST:** Two Categories of Blade Twist exist. They are defined as follows:

- (1) Rotational play is defined as the sum total of rotational movement a propeller blade allows when moved by hand around its axis of rotation (Refer to Figure 602).
 - (a) This movement is, to a limited degree, considered normal and should not be cause for concern. All blades in a propeller should have about the same amount of rotational play.
 - (b) If the difference in rotational play between two blades is beyond 1.0 degree, uneven internal wear and/or damage is the possible cause.

EXAMPLE: Rotational movement of No. 1 blade measures 1.2 degrees, and No. 2 blade measures 2.3 degrees. This would be considered excessive since their difference is beyond 1.0 degree.)

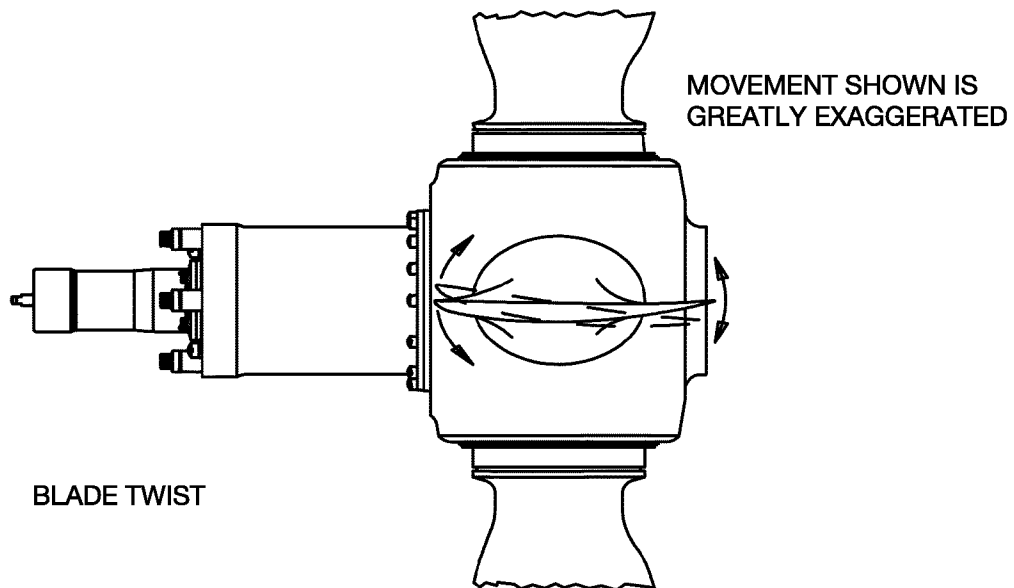
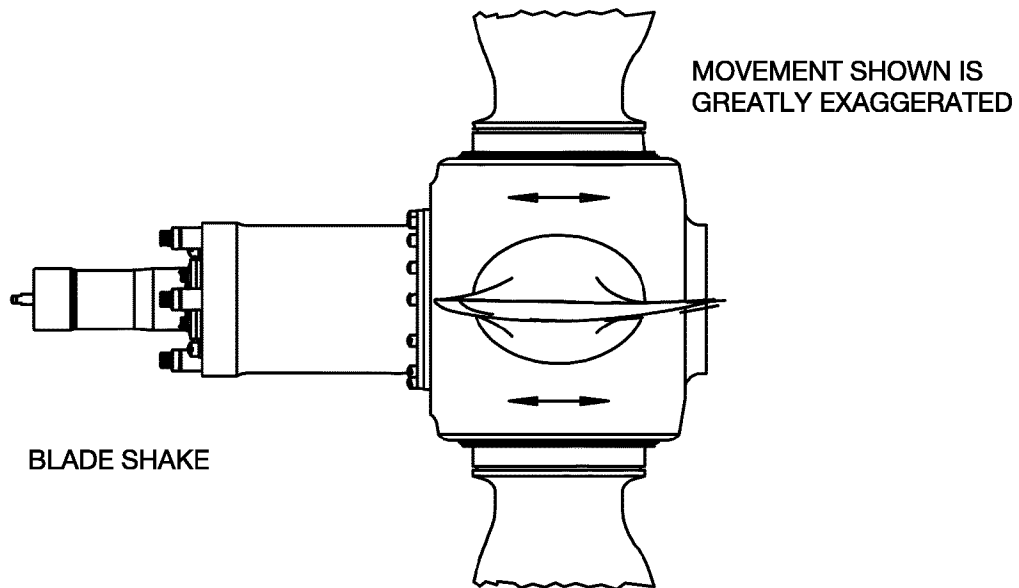
- (c) The cause of the excessive difference should be determined by an FAA approved Part 145 Propeller Repair Station or international equivalent at the next opportunity.
- (2) Blade angle split is a measurement of the angle differences between all the blades in the same propeller. This value is much more critical than rotational play described above, as a high blade angle split may indicate internal problems. While such angle split is very rare, the operator may want to measure it if a problem is suspected, most notably by a marked increase in propeller vibration levels. Blade angle split may be checked as follows:
 - (a) By hand, twist all feathering blades toward high pitch. By hand, twist all non-feathering blades toward low pitch. This will eliminate any play in the propeller linkage, and reduce the possibility of a false angle reading.
 - (b) Using a propeller protractor at the appropriate reference station, measure the angle of each blade.
 - 1 If measurements differ greatly (more than 0.5 degrees) between blades on the same propeller, excessive wear or damage to internal parts may exist.
 - 2 If the blade angle split is in excess of 0.5 degrees, the propeller must be overhauled at an FAA approved propeller service station or international equivalent at the next opportunity.

13. Engine Oil Contamination Inspection Requirements

- A. Any propeller exposed to engine oil contamination must be removed and sent to an FAA approved Part 145 Propeller Repair Station or international equivalent for inspection. Refer to the service information of the engine manufacturer to determine if oil contamination has occurred or to determine the acceptable amount of metal particles allowed in engine oil.

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Blade Shake and Blade Twist
Figure 602 (Sheet 1)

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14. Fire Inspection

- A. Any propeller or governor exposed to fire or excessive heat is considered unairworthy and must be removed from service and scraped. A propeller is considered exposed to fire or excessive heat if after the suspected exposure it shows any of the following conditions:
- (1) Bubbled paint.
 - (2) Discolored paint.
 - (3) Discolored metal.
 - (4) Melted areas.

15. Non-Destructive Inspection Procedures

- A. Fluorescent Dye Penetrant Inspection
- (1) General
 - (a) Fluorescent dye penetrant inspection shall be performed as specified in this manual on products manufactured by McCauley Propeller Systems. Penetrant inspection, for continued airworthiness, shall be used to detect cracks or discontinuities open to the surface which may not be evident by direct visual inspection.

WARNING: Some of the chemicals used in a fluorescent dye penetrant inspection can be harmful to the skin and eyes. The manufacturer's safety precautions must be obeyed when handling fluorescent dye penetrant inspection materials.

- (b) Inspection is performed in accordance with standard ASTM-E-1417 (latest revision), Standard Practice for Liquid Penetrant Examination. McCauley requires all dye penetrant inspections to conform to the Type I Fluorescent Dye and with a sensitivity level 3 as described in the ASTM-E-1417 (latest revision) standard.

NOTE: The use of visible dye penetrants (Type II) is not recommended for the inspection of the propeller and propeller hardware. While Type II visible dye penetrants do have limited crack detection capability, the constituents of visible dye penetrants are likely to deposit residue in crack voids. The residue can be extremely difficult to remove from cracks, regardless of the cleaning method employed. Cracks can become fully or partially masked by the remaining residue. Due to these characteristics, visible dye penetrants can make follow-on detection of existing cracks virtually impossible when using other NDI penetrant methods, specifically Fluorescent Penetrant Inspection (FPI). Use of FPI for NDI type inspections on some propellers and propeller hardware is a requirement at propeller overhaul. Furthermore, visible dye residue contamination of fluorescent penetrant fluid is also known to significantly reduce the brightness of fluorescent indication. Visible dye penetrants include AMS2644, Type 2 red dye penetrant, or any vividly colored dye penetrant visible under ordinary white light. AMS2644, Type 1, Fluorescent penetrants which are visible under ultraviolet light are considered different materials by standard practices and should not be considered a subset of visible dye penetrants.

- (2) Personnel
 - (a) Individuals performing inspections for continued airworthiness defined in this manual shall hold an Airframe and Powerplant rating or international equivalent or the inspection is conducted at an FAA approved Part 145 Repair Station or international equivalent.
- (3) Acceptance Criteria
 - (a) Any verified flaw indications are rejectable.
 - (b) Any indication which is believed to be non-relevant shall be regarded as a defect and shall be reexamined by a McCauley authorized propeller service facility to verify whether or not actual defects are present.

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- (4) Post Cleaning
 - (a) Residual penetrant and developer must be removed prior to recoating using a cleaning solvent or vapor degreasing (refer to Cleaning/Painting/Protective Treatments). Verify complete removal by inspecting under a ultraviolet light.

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CLEANING/PAINTING/PROTECTIVE TREATMENTS

1. General

A. Cleaning Procedures

CAUTION: Do not clean any McCauley propeller part with a steel brush, other metal brush, hard bristle brush, or tool of any type not specified.

CAUTION: As applicable during cleaning procedures, observe allowable dimension limits established for certain parts.

- (1) Remove dirt, paint (when applicable), grease and oil from all disassembled metal parts of propeller.
- (2) Use McCauley approved cleaning mediums only (Refer to Table 701).
- (3) Clean all small, highly finished parts separately.
 - (a) Be careful not to damage small metallic parts, especially on working faces.
 - (b) Clean nonmetallic parts (except gaskets, packings, and seals) by wiping with a soft, lint-free cloth dampened with an approved cleaning medium.
 - (c) Remove thick or packed-on grease or dirt with a soft brush.
 - (d) Allow cleaned parts to air dry.

NOTE: Remove excess moisture with a gentle stream of clean, dry compressed air keeping nozzle of air hose well away from parts.

- (4) Protect cleaned parts from collecting dust and dirt during storage or during handling at overhaul.

NOTE: Keep small parts in transparent plastic bags.

2. Consumable Material

A. General

- (1) This section contains information on materials commonly used for cleaning, repair, rework, painting, etc.
- (2) Contact McCauley Propeller Systems for approval to use materials not included on these lists.

WARNING: Some of the chemicals used for cleaning, painting or for applying a protective treatment can be harmful to the skin and eyes. The manufacturer's safety precautions must be obeyed when handling cleaning, painting or protective treatment materials.

B. Material Control Requirements

- (1) Materials purchased from McCauley Propeller Systems will be labeled with an expiration date control information required by McCauley in a different location from the manufacturer's label. McCauley control information takes precedence should there be any conflicting information with the manufacturer's information.
- (2) For materials purchased from other sources, the purchaser is required to record the expiration date control information on the package.

C. Date Code Formats

- (1) Expiration date may be recorded using the letters "exp" followed by a month and year. In this case, the shelf life of that material extends through the last day of the month and year recorded.
- (2) Cure date for elastomeric products such as O-rings, gaskets, and hoses is normally recorded on the packaging using the numbers 1-4, the letter "Q," and the last two numbers of the year. This marking indicates that the material was cured during a particular "quarter" (i.e. three month period) of the stated year. For example, 1Q92 indicates a cure date of the first quarter of 1992.

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- (3) Cure date marking will suffice for control purposes. The actual date of expiration will occur after the last day of the quarter in the year projected from the cure date plus the allowable number of years for storage.
- D. Consumable Material Management Procedures
- (1) Rotate stock on a first in-first out basis.
 - (2) Epoxy and other materials normally require, at minimum, a room temperature cure. Lower temperatures may greatly increase the cure time. Temperatures below 60°F (16°C) may cause the epoxy to not cure at all.
 - (3) The maximum storage time for O-rings and gaskets:
 - (a) All O-rings must adhere to the storage guidelines set forth in the SAE ARP 5316.
 - (b) All gaskets the maximum storage life is 15 years from the date of cure.
 - (4) Deice Boots.
 - (a) Deice boots do not have a shelf life if stored in accordance with the manufacturer's instructions.
 - (5) Lubricants
 - (a) Table 701. provides a listing of lubricants approved for use in McCauley products.

Table 701. Lubricants

| Part Number | Description | Manufacturer | Notes |
|-------------|---------------------------------|---|--|
| A-1637-4 | Orelube K-2 | Orelube Corp. 201 E. Bethpage Rd. Plainview, NY 11803 Phone: 516-249-6500 | Molybdenum disulfide non-melt grease |
| A-1637-11 | Dyed Oil (Piston engines) | | 1 gallon of Aeroshell Oil W65 and 12 grams of A-4880-1 |
| A-1637-13 | Aeroshell Oil W65 (Recommended) | Shell Oil Company P.O. Box 659501 Houston, TX 78265-9501 | Any SAE 10W or 10W multi-grade piston engine oil is acceptable. |
| A-1637-14 | Turbine Oil BP Turbo Oil 2380 | Air Bp Lubricants 6 Campus Drive Maple Plaza II-IN Parsippany, NJ 07054 Phone: 973-401-4350 Fax: 973-401-4355 Web: www.airbp.com | Turbine oil conforming to MIL-PRF-23699. NOTE: Field technicians may not combine different turbine oils. |
| A-1637-16 | Grease MIL-T-83483 | Convoy Oil Corp. 1412 Front street Philadelphia, PA 19122 Phone: 215-739-5281 Fax: 215-739-6933 | |

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Table 701. Lubricants (continued)

| Part Number | Description | Manufacturer | Notes |
|-------------|---------------------------------|--|---|
| A-1637-18 | Dyed Oil (Turbine engines) | | 1 gallon of BP Turbo Oil 2380 and 12 grams of A-4880-1 |
| A-4880-1 | Red "B" liquid dye | | NOTE: A-4880-1 red "B" liquid dye does not have a shelf life |
| | LPS-3 Heavy duty Rust Inhibitor | LPS Laboratories 7647 Hugh Howell Road Tucker, GA 30085-9206 USA Fax: 770-493-9206 | In corrosive environments, spray on blade retaining snap ring and area to prevent corrosion of the retaining rings. |

(6) Adhesives and Sealants

(a) Table 702. provides a listing of sealants approved for use in McCauley products.

Table 702. Adhesives and Sealants

| Part Number | Description | Manufacturer | Notes |
|-------------|--|--|---|
| A-1664-15 | Scotch-Grip Brand Rubber Adhesive #1300L | 3M Company Bldg. 209 2S 31 3M Center St. Paul, MN 55144 Phone: 651-733-9288 Fax: 651-736-8336 | |
| A-1664-16 | De-icer Conductive Cement #A-56-B | Sovereign Specialty Chemicals SIA Adhesives, Inc 123 W. Bartges Street Akron, OH 44311-1081 Phone: 330-374-2900 Fax: 314-771-1858 | |
| A-1664-17 | 82-076 De-ice Boot Edge Sealer Kit | BFGoodrich De-Icing and Specialty Systems 1555 Corporate Woods Pkwy. Uniontown, OH 44685 Phone: 800-334-2377 | Equivalent to Sterling Lacquer's system |
| A-1664-17 | De-ice Boot Edge Sealer F63B12 | Sherwin-Williams 101 Prospect Ave N. W. Cleveland, OH 44115 Phone: 216-566-2902 | Mix eight parts sealer to one part accelerator. |

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Table 702. Adhesives and Sealants (continued)

| Part Number | Description | Manufacturer | Notes |
|-------------|--------------------------------------|---|--|
| A-1664-17 | De-ice Boot Edge Sealer 78-A-1003 | Sterling Lacquer Mfg. Co. 3160 Brannon Ave. St. Louis, MO 63139 Phone: 314-776-4450 Fax: 314-771-1858 | Mix two parts (A-1664-17) with one part (A-1664-18). |
| | Bostick 1096M Adhesive | Bostik Findley, Inc. 211 Boston Street Middleton, MA 01949-2128 Phone: 978-777-0100 Web: www.bostik.com | |
| | Bostick 1008 Cement | Bostik Findley, Inc | |

(7) Paint and Protective Finish

(a) Table 703. provides a listing of recommended paints, primers and finish materials for use on McCauley products.

Table 703. Paint and Protective Finish

| Part Number | Description | Manufacturer | Notes |
|-----------------------|---|--|--|
| P60G2 | Wash primer | Sherwin-Williams 591 Somerset Tr NE Atlanta, GA 30306 Phone: (404) 885-5510 | P60G2 Wash primer to be mixed with R7K44 Reducer |
| P60G2 | Reducer | Sherwin-Williams | P60G2 Wash primer to be mixed with R7K44 Reducer |
| | E90Y302 Zinc Chromate Primer MIL-P-8585 | Sherwin-Williams | NOTE: This primer has also been identified as Pratt & Lambert Product Number - 723-400, Cessna RMPN - K000440 Specification Certification - TT-P-1757,Rev.B, Type I, Class C, Color Y |
| F563TXB114 92-4302 | Flat Black | Sherwin-Williams | Polane-T Topcoat |
| F63TXW114 45-4302 | White | Sherwin-Williams | Polane-T Topcoat |
| F63TXA1158 2-4302 | Gray | Sherwin-Williams | Polane-T Topcoat |
| F63TXR1134 7-4302 | Red | Sherwin-Williams | Polane-T Topcoat |
| F63TXS1443 3-4302 | Silver | Sherwin-Williams | Polane-T Topcoat |
| F63TXW159 26-4302 | Matterhorn Weight | Sherwin-Williams | Polane-T Topcoat |

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Table 703. Paint and Protective Finish (continued)

| Part Number | Description | Manufacturer | Notes |
|-----------------|--|---|-------------------------|
| V66V27 | Catalyst | Sherwin-Williams | Polane-B Base Component |
| R7K84 | Thinner | Sherwin-Williams | Polane-B Base Component |
| F63B13 | Static Black, Hi Gloss | Sherwin-Williams | Polane-B Topcoat |
| F63BXH120 27 | Cirrus Linen White/Beige | Sherwin-Williams | Polane-B Topcoat |
| | Turcoat Liquid Accelagold | | |
| | Alodine 1200s | Henkel Surface Technologies 32100 Stephenson Highway Madison Heights, MI 19020 Phone: 248-583-9300 | |
| | Alodine 1201 | Henkel Surface Technologies | |
| | 207 High Temperature Aluminum Enamel | Plastic-Kote 1000 Lake Rd. Medina, OH 44256 Phone: 330-725-4511 | |
| | #DE-1615 High Temperature Aluminum Enamel | Sherwin-Williams Dupli-Color Product Group | |
| | Chemical Stripper MIL-R-81294 Type II QPL-81294-26 | | |
| | Turco Transpo Paint remover | Henkel Surface Technologies | |
| | Polane Paint Remover IDS-12D-LT | DeBois Chemical Company | |

(8) Cleaners and Solvents

- (a) Table 704. provides a listing of approved cleaners and solvents for use on McCauley products.

Table 704. Cleaners and Solvents

| Part Number | Description | Manufacturer | Notes |
|-------------|---|--------------|-----------------------------|
| | MPK (methyl propyl ketone) | | |
| | Toluene | | approved substitute for MPK |
| | Oil based Solvent Mixture: One part lubrication oil MIL-L-6082 Grade 10-30 and two parts MIL-PRF-680 Type II (Stoddard Solvent) | | |

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Table 704. Cleaners and Solvents (continued)

| Part Number | Description | Manufacturer | Notes |
|-------------|--|--------------|-------|
| | Mineral spirits MIL-PRF-680, Type. I, II, or III | | |
| | Isopropyl Alcohol T-T-735 | | |
| | Perchloroethane | | |
| | Paint Remover MIL-R-81294 | | |
| | Lacquer Thinner | | |
| | Acetone | | |

(9) Miscellaneous Material

(a) Table 705. provides a listing of recommended miscellaneous materials for use on McCauley products.

Table 705. Various

| Part Number | Description | Manufacturer | Notes |
|-------------|---|--|--|
| | Self-Adhesive Polyurethane Tape 8671 | 3M Company 3M Center St. Paul, MN 55144 Phone: 800-362-3550 Fax: 651-736-8336 Web: www.3m.com | |
| | Non-Etch Alkaline Cleaner NE-7 Cleaner | Enthone/Crookston Electronics 350 Frontage Rd. West Haven, CT 06516 Phone: 203-934-8611 | |
| | Hypodermic syringe, 15 cc with 20- and 24-gauge needles | | |
| | masking tape, 0.25 inch (6.35 mm), 0.5 inch (12.7 mm), 1.0 inch (25.4 mm), 2.0 inch (50.8 mm) | | |
| | cotton swab | | Medical or Cosmetic Grade, Non-sterilized |
| | cotton ball | | Medical or Cosmetic Grade, Non-sterilized |
| | clean, dry, lint-free cloths | | |
| | Abrasive paper 220, 300, 400, and 600 grit wet/dry | | |

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Table 705. Various (continued)

| Part Number | Description | Manufacturer | Notes |
|-------------|---|--------------|-------|
| | ScotchBrite (alternative to sandpaper) medium, coarse, fine | | |
| | Safety wire (NASM20995C20, NASM20995C32, NASM20995C41) | | |
| | Syringe, 1.5 cc hypodermic with 20- and 24-gauge needles | | |

3. Pre-Cleaning Procedures

Table 706. Approved Solvent and Cleaning Medium Applications

| Medium | Application |
|---|--|
| Stoddard Solvent Type II MIL-PRF-680 | to clean any metal surface |
| Methyl-propyl-ketone (MPK) or Acetone or equivalent | to clean metal surface prior to application of sealant |
| | to soften adhesion line between deice boot and blade |
| | to clean slip ring assembly |
| | to remove residual deice boot cement from blade |
| Perchloroethane | to clean aluminum part prior to dye penetrant inspection |
| Paint Remover MIL-R-81294 | to loosen and remove paint and grease |
| Lacquer Thinner | to loosen grease on hub |
| | to loosen/remove general adhesives and sealants |
| | to loosen and remove decals |

4. Blade Cleaning

- A. Clean blade surfaces with a nonmetallic brush and/or plastic rubber scraper.
- B. Thoroughly rinse cleaned blades with tap water and a soft brush.

5. Propeller Protective Treatments

- A. Cadmium Plating
 - (1) Parts that require Cadmium plating shall be taken to an FAA approved Part 145 Propeller Repair Station or international equivalent for disposition and plating.
- B. Cadmium Alternatives: Phosphate Treatment and Zinc-Nickel Plating
 - (1) Parts that require phosphate treatment or zinc-nickel plating shall be taken to an FAA approved Part 145 Propeller Repair Station or international equivalent for disposition and plating.

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- C. Nickel Plating
 - (1) Parts that require Nickel plating shall be taken to an FAA approved Part 145 Propeller Repair Station or international equivalent for disposition and plating.
- D. Thermal Black Oxide Plating
 - (1) Parts that require Thermal Black Oxide plating shall be taken to an FAA approved Part 145 Propeller Repair Station or international equivalent for disposition and plating.
- E. Chrome Plating
 - (1) Parts that require Chrome plating shall be taken to an FAA approved Part 145 Propeller Repair Station or international equivalent for disposition and plating.
- F. Anodize

NOTE: All repaired and overhauled hubs and all repaired blades must be anodized or have Chemical Conversion Film Coating applied for corrosion protection.

- (1) Parts that require to be anodized shall be taken to an FAA approved Part 145 Propeller Repair Station or international equivalent for disposition and to be anodized.

- G. Chemical Conversion Film Coating

NOTE: All repaired hubs and all repaired blades must be anodized or have Chemical Conversion Film Coating applied for corrosion protection.

- (1) General
 - (a) The process for aluminum components must be in accordance with MIL-DTL-5541 and MIL-DTL-81706 Class 1A.
 - (b) All repairs must be complete before the part is treated.
 - (c) All grease, oil, or other material must be removed using solvent and/or a water based cleaner so the part, or the area of the part to be treated, has a water break free surface as required by section 3.3.2 of MIL-DTL-5541.
- (2) All parts that are chemical conversion film coated must have paint applied except on the engine mounting flange, cylinder mounting flange, and the area of the hub socket where the shim carrier contacts the hub.

CAUTION: Paint or primer is not allowed on the engine mounting flange, cylinder mounting flange, and the area of the hub socket where the shim carrier contacts the hub. This is a 5.295 inch (134.5 mm) diameter circle measured from the center of all blade sockets. Paint and primer are not allowed inside of hub socket on threadless propellers.

- H. Corrosion Protection
 - (1) For propellers that operate in salt air or other corrosive environments:
 - (a) Apply LPS-3 around the blade retaining rings and shim carrier.

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6. Blade Painting

NOTE: McCauley strongly recommends that all blades be painted. Paint and primer protect blades from corrosion. McCauley recommends Sherwin-Williams products, but any industry equivalent is acceptable. The following procedure is recommended, but any procedure achieving similar results is acceptable.

NOTE: Repainting the entire propeller blade or the propeller assembly should only be accomplished at an FAA approved Part 145 Propeller Repair Station or international equivalent. Without the proper training and equipment, the static balance of the propeller can be affected by the application of paint.

NOTE: The propeller face side should be painted flat black unless otherwise noted.

A. Paint and Primer Mixtures.

NOTE: McCauley recommends Sherwin-Williams products, but any industry equivalent is acceptable. The following list of paints are recommended, but any equivalent paint that will achieve similar results is acceptable.

NOTE: All drying times are based on 77°F (25°C) and 45% relative humidity.

CAUTION: No paint or primer is allowed in blade retention area or the counterweight surface.

- (1) Primer should be tack free in 10 to 20 minutes and can be recoated in 30 to 60 minutes.
- (2) Allow for different drying times at different temperatures and humidity levels.

Table 707. Paint and Primer Mixtures

| Paint/Primer | Mixture Instructions |
|---|--|
| Primer | 1 Part Sherwin Williams P60G2 Industrial Wash Primer to 1.5 parts Sherwin Williams R7K44 Activator/Thinner |
| Semi-Flat Black Paint F63TXB11492 | Mix as directed by the manufacturer with V66V27 catalyst and R7K84 reducer (Note 1) Federal Standard 595 Color 37038 |
| Semi-Flat White Paint F63TXV11445 | Mix as directed by the manufacturer with V66V27 catalyst and R7K84 reducer (Note 1) Federal Standard 595 Color 17875 |
| Semi-Flat Silver Paint F63TXS14433-4302 | Mix as directed by the manufacturer with V66V27 catalyst and R7K84 reducer (Note 1) |
| Semi-Flat Gray Paint F63YXA11582 | Mix as directed by the manufacturer with V66V27 catalyst and R7K84 reducer (Note 1) |
| Gloss Yellow Paint F63BXY11719 | Mix as directed by the manufacturer with V66V27 catalyst and R7K84 reducer (Note 1) |
| Semi-Flat Red Paint F63TXR11347 | Mix as directed by the manufacturer with V66V27 catalyst and R7K84 reducer (Note 1) Federal Standard 595 Color 31136 |

NOTE 1: The color numbers are assigned by the Atlanta, Georgia Sherwin-Williams facility.

- B.** The painted surface must be recoated with the first coat of the finish enamel within four hours of application of the primer.

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- C. Apply the paint in accordance with the manufacturer's instructions.

NOTE: Overnight drying time is recommended after paint application.

- D. The recommended dry film paint thickness on constant speed and full feathering propeller blades should be 3 mils thick, and on turbine propellers 6 mils thick.

NOTE: Tip stripes should be painted on the camber side only so as not to interfere with the pilot's field of vision. Some propellers installed in a pusher configuration (and out of the pilot's field of view) may have a different paint scheme for the propeller blade tips.

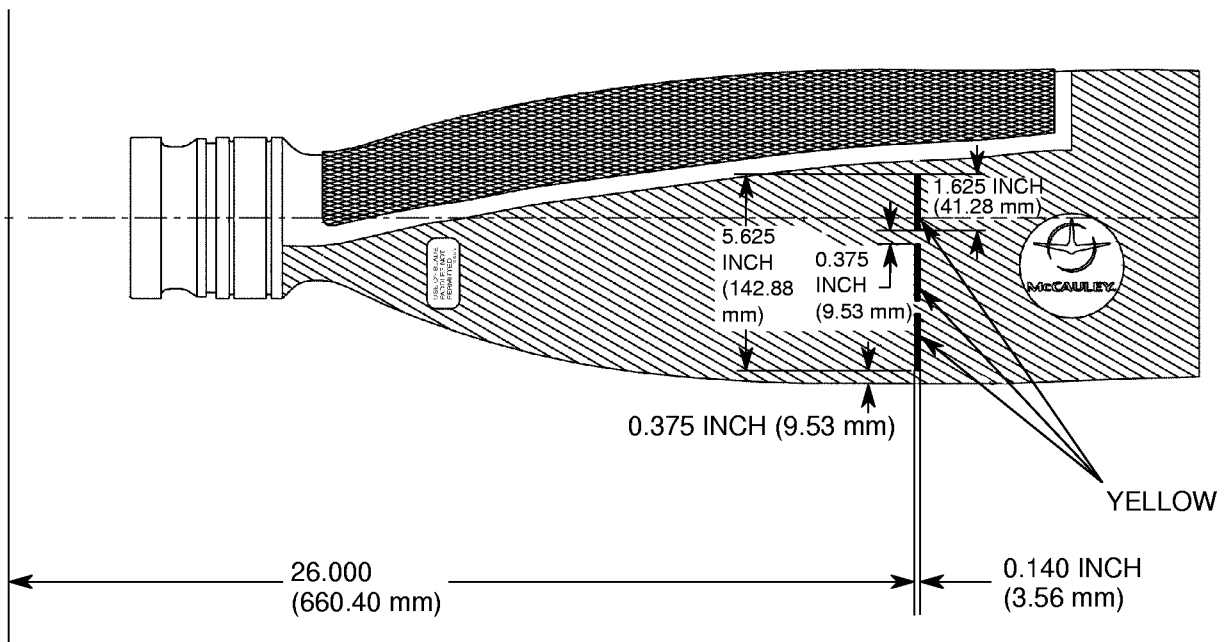
- E. On turbine propellers only, make sure there is a 2 inch (51 mm) long by 0.070 inch (1.8 mm) wide yellow or white line at the 30 inch (762 mm) station (except for the paint scheme that is used on C1101, C1102, C1103, and C1104 model propellers which places the line at the 42 inch (107 mm) station). This line indicates the blade angle reference station. Center the line between the trailing and leading edges. When requested by the owner of a fleet, this line may be left off or painted a specific color.
- F. Special Instructions for Fixed Pitch Propellers:
(1) Do not paint flat, engine mating surface side of the propeller hub.
- G. Special Instructions for C1103 and C1104 model Propellers (Figure 702):
(1) Make sure the thin dashed yellow lines at the 26 inch (660 mm) station on both the face and camber sides of the blade are maintained and easily visible. This marks the end of the shotpeen region of the blade. (refer to Figure 702).

7. Spinner Chrome Plating

- A. McCauley does not approve the chrome plating of McCauley propeller spinners. Field experience has shown that chrome plated spinners often peel after a short time in service. Strong evidence also exists that chrome plating can lead to spinner fatigue cracking, thus scrapping the spinner shell. Chrome plating will void the McCauley warranty.

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Shotpeen Lines on C1103 and C1104
Figure 701 (Sheet 1)

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PROPELLER APPROVED REPAIRS

1. Blade Repair

A. Removal of Blade Damage

(1) General

- (a) The propeller blade is a highly stressed part. The fact that propeller blades are subject to impact damage, (such as nicks, gouges, and scratches), and corrosion, (primarily uniform etch and pitting corrosion, but intergranular or exfoliation type corrosion can also occur) demands frequent inspection and maintenance.
- (b) Repair of small nicks, gouges and scratches that do not exceed the damage specifications identified in this section, Blade Repair are considered "Minor Repairs" and may be performed by an appropriated rated mechanic or repair station. After filing and polishing, the damaged area should be inspected, and when possible, by fluorescent dye penetrant method to verify that all damage has been removed and the blade is not cracked. The area should then be re-protected by localized application of chemical film per MIL-C-5541 (for example, Alodine) and repainted as necessary.

NOTE: Refer to the Non-Destructive Inspection Procedures for fluorescent dye penetrant inspection procedures.

NOTE: If it is not possible to inspect the repaired area using the fluorescent dye penetrant inspection method, the repaired region should be inspected with a minimum 10x power lens to ensure any sharp notches or cracks have been removed.

- (c) All other damage that exceeds the damage specifications identified in this section, Blade Repair, or other damage such as bent blades, are considered "Major Repairs" and must be corrected by a McCauley authorized service facility and are not field repairable.

(2) Damage Specifications

- (a) The depth of damage must be measured using a depth gage.
- (b) Damage that is located on the leading or trailing edges must not exceed 0.094 inch (2.39 mm) in depth.
- (c) Damage that is located on a repairable area of the face or camber side of the blade must not exceed 0.061 inch (1.55 mm) in depth.
 - 1 For controllable pitch propellers:
 - a Impact and corrosion damage that is located at least 6.0 inches (152 mm) from the hub socket is in an area that is field repairable.
 - 2 For fixed pitch propellers:
 - a Impact and corrosion damage that is located at least 12.0 inches (305 mm) from the center of the propeller mounting flange is in an area that is field repairable.
- (d) Damage that is located outside the field repairable area or damage depth greater than these limits is not field repairable. An FAA approved Part 145 Propeller Repair Station or international equivalent may be able to do a repair. Contact McCauley Product Support for disposition of any damage that is deeper than the specified limits.

(3) Repairable Damage

- (a) The primary type of blade damage that a mechanic need be concerned with is sharp stress riser type damage. This type of damage is caused by stones or other small objects striking the propeller blade as it rotates. Erosion caused by sand, water, etc. that does not create sharp stress riser type damage does not need to be repaired in the field.

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CAUTION: The use of a rasp file is not recommended for field repairs. Rasp-type files will remove more metal than necessary, and may cause premature rejection of the blade at propeller overhaul.

NOTE: If the propeller blade has erosion damage and there are no signs of corrosion, no further action is required. However, it is recommended that erosion damage be protected from corrosion with a chemical conversion film coat (for example, Alodine) and then touch up the propeller paint in accordance with the Blade Painting procedures.

- (b) Give close attention to deice boots during visual inspection. Boot damage may have penetrated the boot heating element and damaged the blade. Remove the boot and inspect the propeller blade if this type of damage is suspected.

NOTE: Do not assume the deice boot (if installed) is not damaged if it is heating normally.

1 Small object damage is normally found on the leading edge and face side of the propeller blade. Damage will normally occur on reversing propellers on the camber side at the outboard stations.

- (c) It is very important that stress riser type damage be completely repaired. When filing the damaged area is complete, a fluorescent dye penetrant examination of the affected area should be performed, when possible, to verify that the stress riser has been completely removed.

NOTE: If it is not possible to inspect the repaired area using the fluorescent dye penetrant inspection method, the repaired region should be inspected with a minimum 10x power lens to ensure any sharp notches or cracks have been removed.

1 A stress riser can cause the failure of a propeller blade if not repaired properly.

2 A stress riser is an increase in stress intensity surrounding an area of reduced cross-sectional area. A sharp stress riser is an increased stress intensity attributed to a notch-like displacement of material resulting from a sharp object impact, leaving a very small radius at the bottom of the displaced material, refer to Figure 801.

NOTE: Sometimes a stress riser in the propeller may be referred to as a nick.

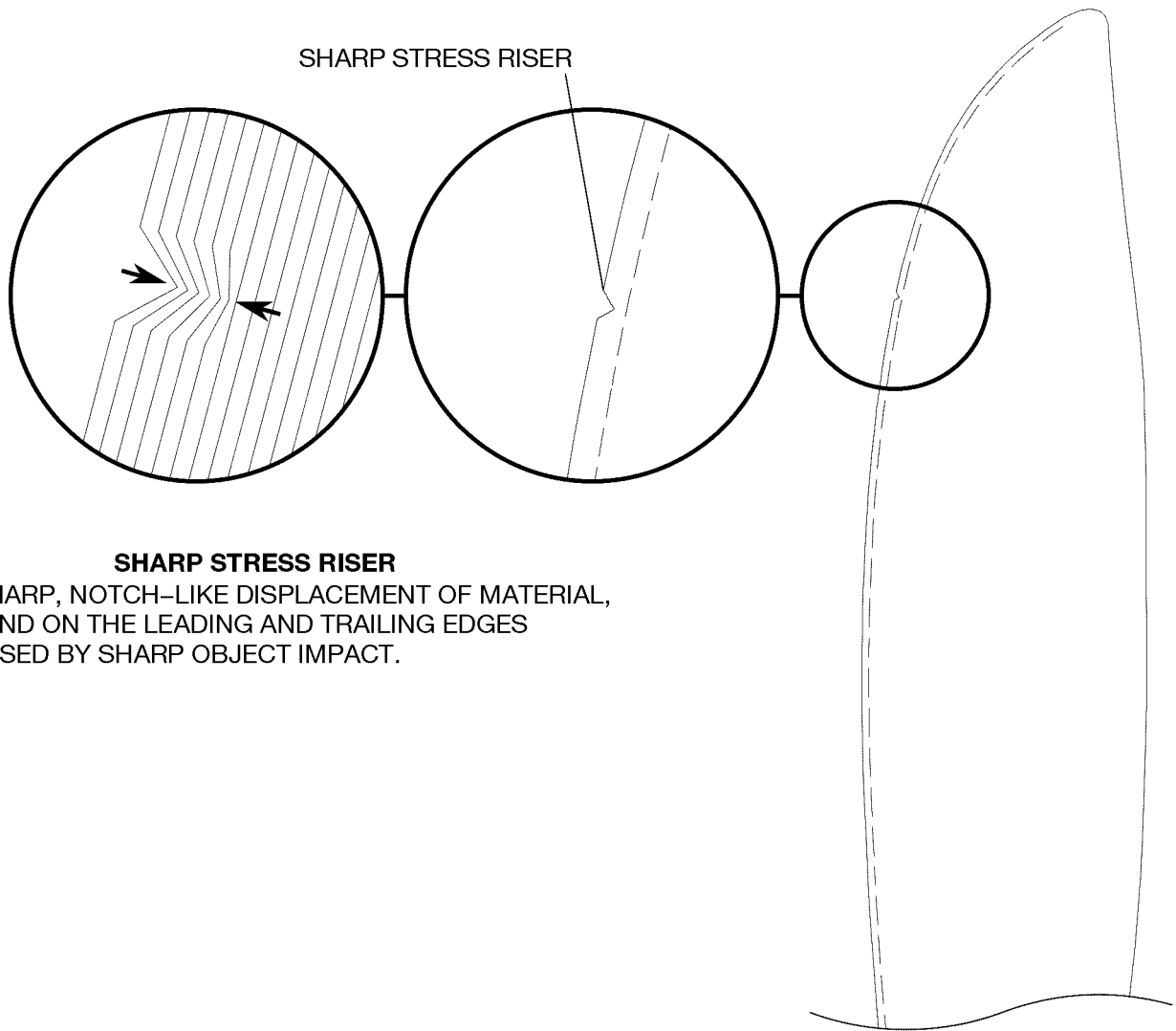
3 Stress riser damage found during a routine inspection must be field repaired if it is not beyond the field repair limits. If the damage appears to be beyond the field repair limits, the blade must be evaluated and/or replaced by an approved McCauley propeller service facility. Stress risers may be caused by sharp, hard objects striking the rotating blade, or can develop from corrosion such as exfoliation or intergranular type corrosion.

4 Blade erosion is the abrading of surface material attributed to impact with small particles such as sand, dirt, and water. Small object impact typically does not cause sharp bottom radiuses and therefore do not result in sharp stress risers or significant material displacement that elevate the stress intensity to a level which cause crack initiation. Erosion of the blade surface that does not result in stress risers, does not require field repair of the damaged surface. If significant material displacement has occurred, measure the area of the blade with the most erosion damage.

a Damage that is located on the leading or trailing edges must not exceed 0.094 inch (2.39 mm) in depth. Damage greater than 0.094 inch (2.39 mm) in depth is not field repairable.

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Sharp Stress Riser
Figure 801 (Sheet 1)

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- b Damage that is located on a repairable area of the face or camber side of the blade must not exceed 0.061 inch (1.55 mm) in depth. Damage greater than 0.061 inch (1.55 mm) in depth is not field repairable.

5 If corrosion is observed on the propeller:

- a For uniform etch type corrosion, remove the corrosion and clean the affected area of the propeller and chemical conversion film coat, and if applicable, touch up the paint in accordance with the Cleaning/Painting/Protective Treatments instructions.
- b For pitting, intergranular or exfoliation type corrosion, remove the corrosion and examine the affected area for stress riser damage. If stress riser damage is found, repair the damage. Clean the affected area of the propeller and chemical conversion film coat, and if applicable, touch up the paint in accordance with the with the Cleaning/Painting/Protective Treatments instructions.

NOTE: After the corrosion is removed, measure the damaged area, damage that is located on the leading or trailing edges must not exceed 0.094 inch (2.39 mm) in depth and damage that is located on a repairable area of the face or camber side of the blade must not exceed 0.061 inch (1.55 mm) in depth.

- 6 If erosion is repaired, corrosion protect the propeller blade in the area of the repair. Chemical conversion film coat (for example, Alodine) the repaired area and then touch up the propeller paint in accordance with the with the Cleaning/Painting/Protective Treatments instructions.

(4) Repair Criteria

- (a) Repair stress riser damage. Stress riser damage is repaired by removing adjacent material from the damaged area so that there is no longer a notch of displaced material with a very small radius at the bottom of the damaged area. Material is removed with small smooth cut mill files, emery cloth, and/or sandpaper. When the stress riser removal is complete, perform a fluorescent dye penetrant inspection to verify that the stress riser has been completely removed. Refer to Non-Destructive Inspection Procedures for fluorescent dye penetrant inspection procedures.
- (b) Do not remove more material than what is required to remove the stress riser from the propeller blade. Unnecessary or excessive propeller blade material removal will cause premature replacement of the propeller blade at propeller overhaul.
- (c) Leading and Trailing Edge Repair Procedure
 - 1 Determine the depth of the damaged area.
 - a The depth of damage must be measured using a depth gage.
 - b Damage that is located on the leading or trailing edges must not exceed 0.094 inch (2.4 mm) in depth.
 - c Damage depth greater than this limit is not field repairable.

NOTE: An FAA approved Part 145 Propeller Repair Station or international equivalent may be able to do a repair. Contact McCauley Product Support for disposition of any damage that is deeper than the specified limits.

- 2 Remove metal at the damaged area starting back from and working toward the edge in such a way that the contour remains substantially the same. File strokes must run from blade shank to blade tip. Avoid abrupt changes in contour and blunt edges.
- 3 The length of the blended area shall be equal to 10 times the depth of the damage. Refer to Figure 802.
- 4 The finished repair should be the depth of the original damage plus 0.031 inch (0.8 mm)
- 5 Initial removal of material should be done using a small smooth cut mill file.
- 6 All traces of file marks in the repaired area should be removed with number 240 emery cloth or equivalent grit sandpaper.

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- 7 Smooth the repaired area followed by polishing with number 320 emery cloth and 600 grit emery cloth or equivalent grit sandpaper.

NOTE: Do not use sandpaper or emery cloth that contains iron oxide material on aluminum propellers.

- 8 Determine the depth of the repaired damaged area.
- a The maximum depth of the damage repair area must be measured using a depth gage.
 - b The repair that is located on the leading or trailing edges must not exceed 0.125 inch (3.2 mm) in depth.
 - c Propeller damage depth greater than this limit is not field repairable.

NOTE: An FAA approved Part 145 Propeller Repair Station or international equivalent may be able to do a repair. Contact McCauley Product Support for disposition of any damage that is deeper than the specified limits.

(d) Face And Camber Repair Procedure

- 1 Determine the depth of the damaged area.
- a The depth of damage must be measured using a depth gage.
 - b Damage that is located on the face or camber sides of the propeller must not exceed 0.061 inch (1.55 mm) in depth.
 - c Damage depth greater than this limit is not field repairable.

NOTE: An FAA approved Part 145 Propeller Repair Station or international equivalent may be able to do a repair. Contact McCauley Product Support for disposition of any damage that is deeper than the specified limits.

CAUTION: Use extreme care to control the hand held grinder.

- 2 Remove metal at the damaged area by hand using a coarse grain emery cloth or by a hand held rotary grinder with 120 or finer grit bob. Do not use a hand file in this area.

NOTE: Do not use sandpaper or emery cloth that contains iron oxide material on aluminum propellers.

- 3 Grind blade with light pressure in a circular motion until damage is totally removed. The diameter of the repair shall be equal to 20 times the depth of damage. Refer to Figure 802.
- 4 The finished repair should be the depth of the original damage plus 0.002 inch (0.05 mm)
- 5 Smooth the repaired area with number 240 and 320 emery cloth or equivalent grit sandpaper.
- 6 Polish the repaired area with number 600 grit emery cloth or equivalent grit sandpaper.

NOTE: Do not use sandpaper or emery cloth that contains iron oxide material on aluminum propellers.

- 7 Determine the depth of the repaired damaged area.
- a The maximum depth of the damage repair area must be measured using a depth gage.
 - b The repair that is located on the face or camber sides of the propeller must not exceed 0.063 inch (1.6 mm) in depth.

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- c Propeller damage depth greater than this limit is not field repairable.

NOTE: An FAA approved Part 145 Propeller Repair Station or international equivalent may be able to do a repair. Contact McCauley Product Support for disposition of any damage that is deeper than the specified limits.

- (e) Inspect Repaired Area
- 1 Do a fluorescent dye penetrant inspection to verify that the stress riser has been completely removed. Refer to Non-Destructive Inspection Procedures for fluorescent dye penetrant inspection procedures.
- (f) Blade Painting After Repair
- 1 Prepare the repaired area for touch up paint by wiping with a Methyl n-Propyl Ketone (MPK) dampened cloth.
 - 2 Corrosion protect the propeller blade in the area of the repair. Refer to Cleaning/Painting/Protective Treatments for instructions for the application of a chemical conversion film coating (for example, Alodine) on the repaired area of the propeller.
 - 3 Touch up the propeller paint in accordance with the procedures in Cleaning/Painting/Protective Treatments to blend the paint with the original finish.
 - 4 Recheck the dynamic balance of the propeller if the propeller is installed on a turbine engine.

B. Blade Painting

(1) General

- (a) Propeller blades are painted with polyurethane enamel paint. This paint provides optimum durability and abrasion resistance. If paint becomes eroded and is not repainted, damage to aluminum blade surface will be accelerated. This is particularly true at blade tips where operation in rain or reversing on sandy and/or wet runways can cause accelerated wear. It is, therefore, important to touch-up the paint on the propeller blades frequently as part of a regular maintenance schedule.

(2) Painting Materials and Procedures

WARNING: Some of the chemicals used in painting the propeller can be harmful to the skin and eyes. The manufacturer's safety precautions must be obeyed when handling paint and paint preparation materials.

NOTE: Follow the painting procedures specified by the paint manufacturer when painting the propeller.

- (a) It is recommended that final dry film paint thickness be 6 to 9 mils for best abrasion resistance.
- (b) For more information concerning the propeller paint, refer to the procedures in Cleaning/Painting/Protective Treatments.

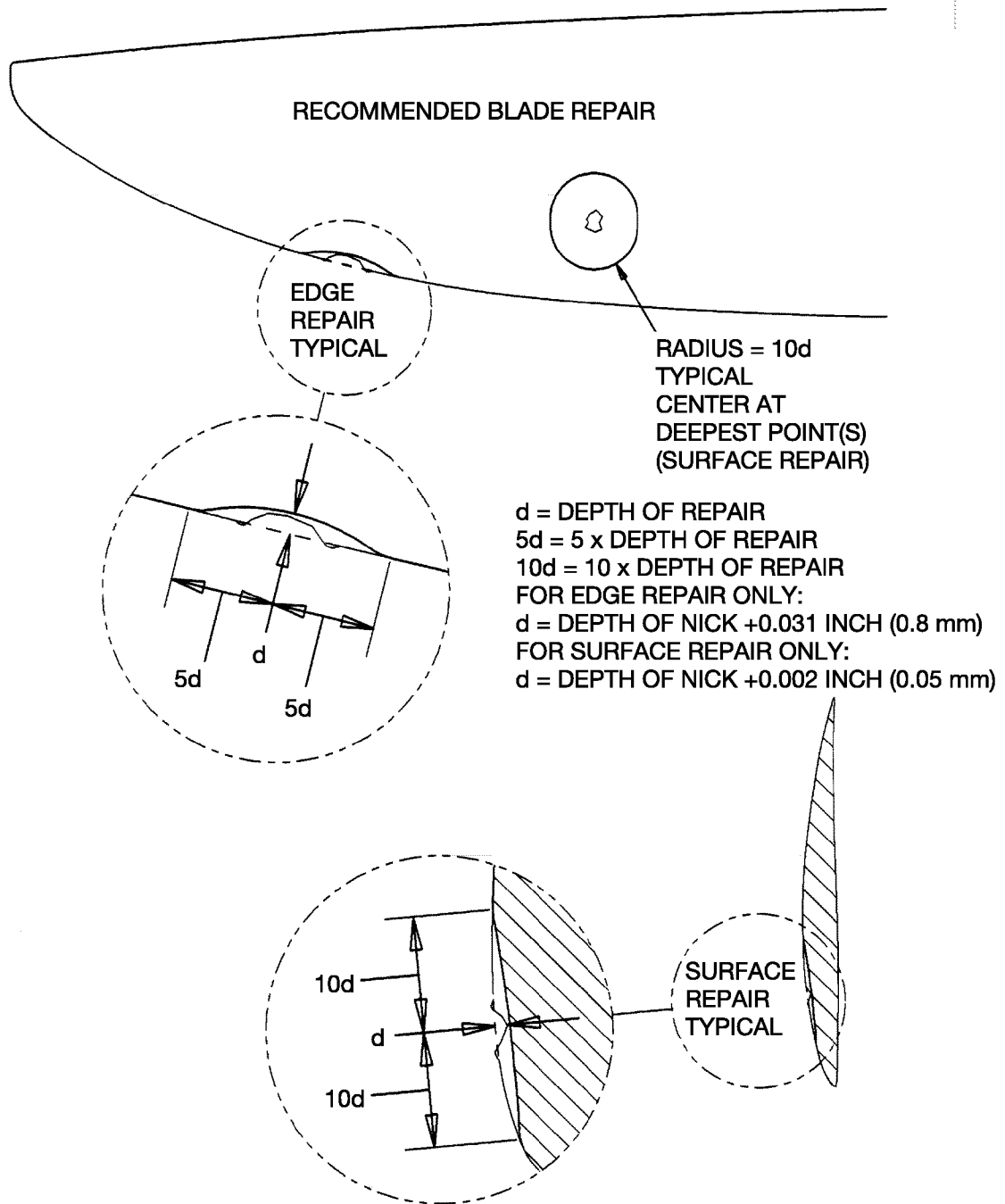
NOTE: Repainting the entire propeller blade or the propeller assembly should only be accomplished at a McCauley authorized propeller service facility. Without the proper training and equipment, the static balance of the propeller can be affected by the application of paint.

2. Spinner Repair

- A. No repair is permitted on any McCauley spinner, spinner front support, or spinner bulkhead. Follow these guidelines to determine if a part is airworthy:
- (1) If the part has scratches and minor dents, the part can continue to be used.
 - (2) If the part is cracked, the part must be replaced.

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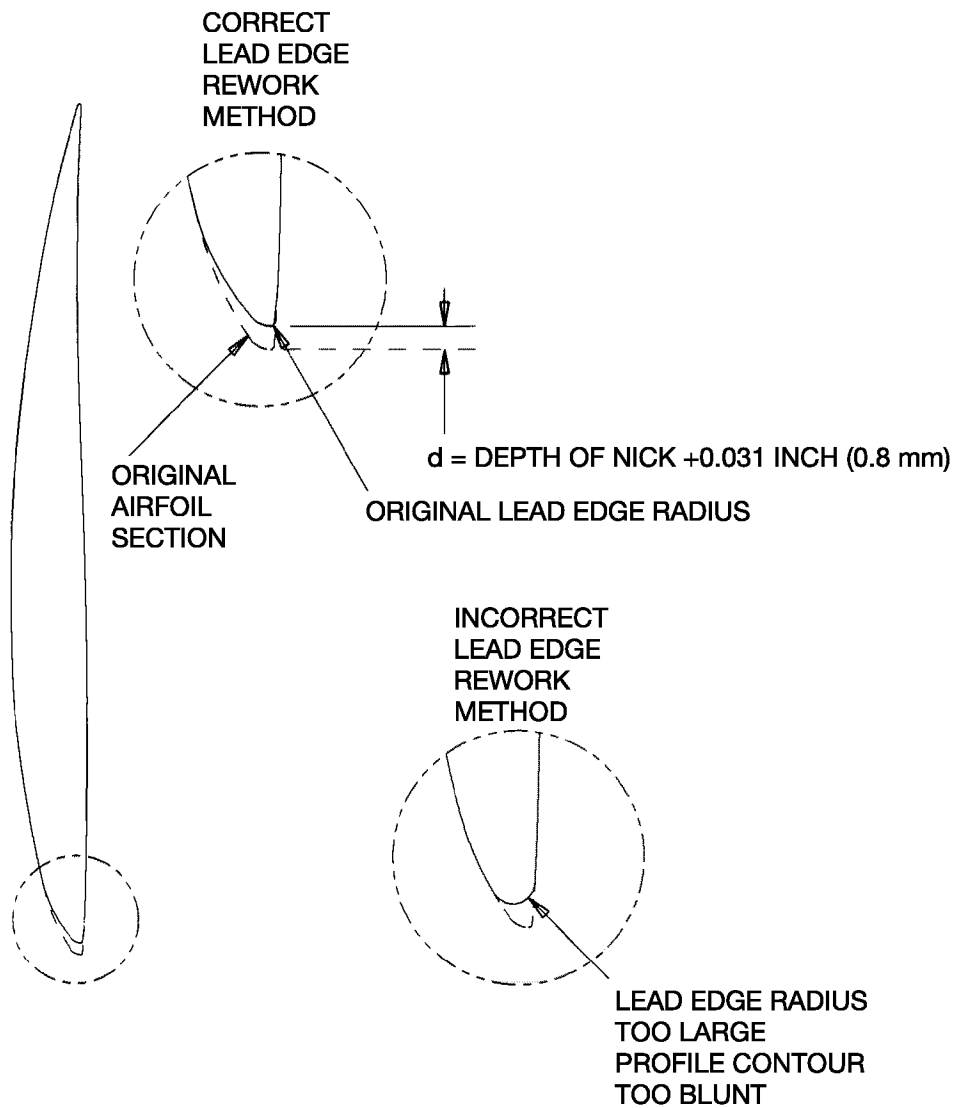
C53



Field Blade Rework Criteria
 Figure 802 (Sheet 1)

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GENERAL RULES:
DO NOT REDUCE THE MAXIMUM THICKNESS OF SECTION.
KEEP THE ORIGINAL LEAD EDGE RADIUS.
BLEND TO THE PROFILE OF THE AIRFOIL SECTION.

Field Blade Rework Criteria
Figure 802 (Sheet 2)

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PROPELLER INSTALLATION PARTS LIST

1. General

- A. Use the Installation Parts List to identify and order correct replacement parts for propeller field maintenance.
- B. These parts may be purchased through your local authorized McCauley propeller service facility.

Table 1001. Installation Parts for Constant Speed Piston Engine Propellers

| | C200 Series | C300 Series | C400 Series | C500 Series |
|-------------------------------------|--------------------|--------------------|--------------------|--------------------|
| Mount Nut | A-1639-2 | A-1639-2 | A-1639-2 | A-1639-2 |
| Mount Nut | | | | A-1639-32 |
| Spacer | | | | A-4494 |
| Mount O-ring | A-1633-3 | A-1633-3 | A-1633-3 | A-1633-3 |
| Mount O-ring Lycoming | A-1633-11 | | A-1633-11 | A-1633-11 |
| Mount O-ring | | | | A-1633-49 |
| Spinner Screw, bright nickel plated | A-1635-133 | | A-1635-133 | A-1635-133 |
| Spinner Screw, cadmium plated | A-1635-39 | | A-1635-39 | A-1635-39 |
| Spinner Washer, fiber | A-1638-5 | | A-1638-5 | A-1638-5 |
| Spinner Shim | B-3410-16 | | B-3410-16 | B-3410-16 |
| Spinner Shim | B-3410-32 | | B-3410-32 | B-3410-32 |

NOTE 1: Mount nut A-1639-2 is 1/2-inch, A-1639-32 is 9/16-inch.

NOTE 2: Not all parts listed for a propeller series are required for every model propeller.

Table 1002. Installation Parts for Turbine Engine Propellers

| | C600 Series | C650 Series | C700 Series | C750 Series | C1000 Series | C1100 Series |
|--|--------------------|--------------------|--------------------|--------------------|---------------------|---------------------|
| Mount Nut | A-1639-32 | A-1639-32 | A-1639-32 | A-1639-32 | A-1639-46 | A-1639-32 |
| Mount Nut | | | | | A-1639-32 | |
| Spacer | A-4945 | B-5096 | B-5096 | B-5096 | B-5096 | B-5096 |
| Mount O-ring | A-1633-63 | A-1633-72 | A-1633-72 | A-1633-72 | A-1633-72 | A-1633-72 |
| Mount O-ring | | | | | A-1633-98 | |
| Spinner Screw, bright nickel plated | A-1635-133 | A-1635-133 | A-1635-133 | A-1635-133 | | A-1635-133 |
| Spinner Screw, cadmium plated | A-1635-39 | A-1635-39 | A-1635-39 | A-1635-39 | | |
| Spinner Screw, cadmium plated dyed black | | | | | A-1635-172 | |

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Table 1002. Installation Parts for Turbine Engine Propellers (continued)

| | C600 Series | C650 Series | C700 Series | C750 Series | C1000 Series | C1100 Series |
|-----------------------|-------------|-------------|-------------|-------------|--------------|--------------|
| Spinner Washer, fiber | A-1638-5 | A-1638-5 | A-1638-5 | A-1638-5 | A-1638-44 | A-1638-5 |
| Spinner Shim | B-4940-1 | B-4940-1 | B-4940-1 | B-4940-1 | B-4940-1 | B-4940-1 |
| Spinner Shim | B-4940-2 | B-4940-2 | B-4940-2 | B-4940-2 | B-4940-2 | B-4940-2 |

NOTE 1: C1100 Series does not include C1101 through C1104.

Table 1003. Installation Parts for Fixed Pitch Propellers

| Basic Propeller Model Number | Spacer P/N | Dowel P/N | Fixed Pitch Bolt Kit | | | | | | |
|------------------------------|------------|-----------|----------------------|-----------|----------------|-----------|-----------|------------|----------|
| | | | Bolt Kit P/N | Bolt Dia. | Dri-illed Head | No. Bolts | Bolt P/N | Washer P/N | Nut P/N |
| 1A100/ACM | B-3400 | A-2973-6 | B-4622-10 | 3/8 | Yes | 6 | A-2513-11 | A-1638-13 | NA |
| 1P235/AFA | NA | NA | B-4622-25 | 1/2 | Yes | 6 | A-2513-13 | A-1638-2 | NA |
| C172/AGM | B-3515 | A-2973-6 | B-4622-15 | 3/8 | Yes | 6 | A-2513-25 | A-1638-13 | NA |
| C190/ALM | C-3635 | Note 2 | B-4622-8 | 3/8 | Yes | 6 | A-2513-30 | A-1638-13 | A-1639-6 |
| 1A200/AOM | NA | A-4001 | B-4622-4 | 1/2 | No | 6 | A-2513-17 | A-1638-2 | A1639-2 |
| 1A175/ATM | B-3898 | A-2973-6 | B-4622-20 | 7/16 | Yes | 6 | A-2513-38 | A-1638-11 | NA |
| 1A105/BCM | B-3927 | A-2973-6 | B-4622-16 | 3/8 | No | 6 | A-2513-20 | A-1638-14 | NA |
| 1B235/BFA | B-3637 | A-2973-6 | B-4622-27 | 1/2 | Yes | 6 | A-2513-33 | A-1638-10 | NA |
| 1A170/BMS | B-6627 | A-2973-6 | B-4622-41 | 1/2 | Yes | 6 | A-2513-99 | A-1638-2 | NA |
| 1A135/BRM | B-3718 | A-2973-7 | B-4622-1 | 1/2 | Yes | 6 | A-2513-18 | A-1638-10 | A-1639-2 |
| | | A-4001 | | | | | | | |
| 1C172/BTM | B-4381 | A-2973-6 | B-4622-37 | 7/16 | Yes | 6 | A-2513-79 | NA | NA |
| 1A90/CF | NA | NA | B-4622-9 | 3/8 | Yes | 6 | A-2513-8 | A-1638-13 | NA |
| 1A90/CF Note 3 | NA | NA | B-4622-42 | 3/8 | Yes | 6 | A-2513-9 | A-1638-13 | A-1639-6 |
| 1A170/CFA | B-3637 | A-2973-6 | B-4622-23 | 1/2 | Yes | 6 | A-2513-33 | A-1638-2 | NA |
| 1A90/CH | NA | Note 2 | B-4622-42 | 3/8 | No | 6 | A-2513-9 | A-1638-13 | A-1639-6 |
| 1C90/CLM | B-3515 | A-2973-6 | B-4622-33 | 3/8 | Yes | 6 | A-2513-41 | A-1638-13 | NA |
| 1B90/CM | NA | NA | B-4622-9 | 3/8 | Yes | 6 | A-2513-8 | A-1638-13 | NA |
| 1B90/CM Note 3 | NA | Note 2 | B-4622-42 | 3/8 | Yes | 6 | A-2513-9 | A-1638-13 | A-1639-6 |
| 1A135/CRM | B-3718 | A-2973-7 | B-4622-1 | 1/2 | Yes | 6 | A-2513-18 | A-1638-10 | A-1639-2 |
| | | A-4001 | | | | | | | |
| 1C160/CTM | B-3898 | A-2973-6 | B-4622-20 | 7/16 | Yes | 6 | A-2513-38 | A-1638-11 | NA |
| 1A101/DCM | NA | NA | B-4622-9 | 3/8 | Yes | 6 | A-2513-8 | A-1638-13 | NA |
| 1A170/DF | NA | NA | B-4622-30 | 3/8 | Yes | 8 | A-2513-10 | A-1638-13 | NA |
| 1A200/DFA | B-3434 | A-2973-6 | B-4622-28 | 1/2 | Yes | 6 | A-2513-18 | A-1638-10 | NA |
| 1B235/DFC | NA | A-4001 | B-4622-5 | 1/2 | No | 6 | A-2513-16 | A-1638-2 | A-1639-2 |
| 1C90/DLM | B-4160 | A-2973-6 | B-4622-13 | 3/8 | Yes | 6 | A-2513-43 | A-1638-13 | NA |

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Table 1003. Installation Parts for Fixed Pitch Propellers (continued)

| Basic Propeller Model Number | Spacer P/N | Dowel P/N | Fixed Pitch Bolt Kit | | | | | | |
|------------------------------|------------------|--------------------|----------------------------|-----------|--------------|-----------|------------|------------|----------|
| | | | Bolt Kit P/N | Bolt Dia. | Drilled Head | No. Bolts | Bolt P/N | Washer P/N | Nut P/N |
| 1A170/DM | NA | NA | B-4622-30 (Short Bolt Kit) | 3/8 | Yes | 8 | A-2513-10 | A-1638-13 | NA |
| 1A170/DM | NA | NA | B-4622-36 (Long Bolt Kit) | 3/8 | Yes | 8 | A-2513-23 | A-1638-14 | NA |
| 1A175/DM | NA | NA | B-4622-30 (Short Bolt Kit) | 3/8 | Yes | 8 | A-2513-10 | A-1638-13 | NA |
| 1A175/DM | NA | NA | B-4622-36 (Long Bolt Kit) | 3/8 | Yes | 8 | A-2513-23 | A-1638-14 | NA |
| 1A135/DRM | C-7639 | A-2973-7 A-4001 | B-4622-1 | 1/2 | Yes | 6 | A-2513-18 | A-1638-10 | A-1639-2 |
| 1C160/DTM | B-4516 C-4592 | A-2973-6 | B-4622-20 | 7/16 | Yes | 6 | A-2513-38 | A-1638-11 | NA |
| 1B90/ECM | B-3927 | A-2973-6 | B-4622-16 | 3/8 | Yes | 6 | A-2513-20 | A-1638-14 | NA |
| 1A170/EFA | B-4020 | A-2973-6 | B-4622-24 | 1/2 | Yes | 6 | A-2513-39 | A-1638-2 | NA |
| 1B235/EFC | C-7744 | A-2973-7 A-4001 | B-4622-45 | 1/2 | Yes | 6 | A-2513-103 | A-1638-2 | A-1639-2 |
| 1C160/EGM | NA | NA | B-4622-14 | 3/8 | Yes | 6 | A-2513-19 | A-1638-13 | NA |
| 1C172/EM | NA | A-4001 | B-4622-3 | 1/2 | No | 6 | A-2513-14 | A-1638-10 | A-1639-2 |
| 1A175/ETM | B-4516 C-4592 | A-2973-6 | B-4622-20 | 7/16 | Yes | 6 | A-2513-38 | A-1638-11 | NA |
| 1A200/FA | NA | NA | B-4622-26 | 1/2 | Yes | 6 | A-2513-15 | A-1638-2 | NA |
| 1A175/FC | NA | A-4001 | B-4622-4 | 1/2 | No | 6 | A-2513-17 | A-1638-2 | A-1639-2 |
| 1C200/FC | NA | A-4001 | B-4622-4 | 1/2 | No | 6 | A-2513-17 | A-1638-2 | A-1639-2 |
| 1B90/FCM | B-4301 | A-2973-6 | B-4622-17 | 3/8 | Yes | 6 | A-2513-53 | A-1638-14 | NA |
| 1A170/FFA | B-4273 | A-2973-6 | B-4622-38 | 1/2 | Yes | 6 | A-2513-71 | NA | NA |
| 1C160/FGM | B-4561 | A-2973-6 | B-4622-19 | 3/8 | Yes | 6 | A-2513-41 | A-1638-14 | NA |
| 1A200/FM | NA | NA | B-4622-31 | 7/16 | Yes | 8 | A-2513-12 | A-1638-11 | NA |
| 1A101/GCM | B-4304 | A-2973-6 | B-4622-11 | 3/8 | Yes | 6 | A-2513-51 | A-1638-13 | NA |
| 1A170/GM | NA | NA | B-4622-14 | 3/8 | Yes | 6 | A-2513-19 | A-1638-13 | NA |
| 1A175/GM | NA | NA | B-4622-14 | 3/8 | Yes | 6 | A-2513-19 | A-1638-13 | NA |
| 1A175/GMA | B-3515 | A-2973-6 | B-4622-15 | 3/8 | Yes | 6 | A-2513-25 | A-1638-13 | NA |
| 1A101/HCM | B-4351 | A-2973-6 | B-4622-12 | 3/8 | Yes | 6 | A-2513-77 | A-1638-14 | NA |
| 1A200/HFA | B-4585 | A-2973-6 | B-4622-29 | 1/2 | Yes | 6 | A-2513-70 | A-1638-10 | NA |
| 1B200/HM | C-1225 | NA | B-4622-31 | 7/16 | Yes | 8 | A-2513-12 | A-1638-11 | NA |
| 1A135/JCM | B-3927 | A-2973-6 | B-4622-18 | 3/8 | Yes | 6 | A-2513-43 | A-1638-14 | NA |

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Table 1003. Installation Parts for Fixed Pitch Propellers (continued)

| Basic Propeller Model Number | Spacer P/N | Dowel P/N | Fixed Pitch Bolt Kit | | | | | | |
|------------------------------|------------------|-----------|----------------------|-----------|----------------|-----------|------------|----------------------------|----------|
| | | | Bolt Kit P/N | Bolt Dia. | Dri-illed Head | No. Bolts | Bolt P/N | Washer P/N | Nut P/N |
| 1A170E/JFA | C-5464 C-7726 | A-2973-6 | B-4622-40 | 1/2 | Yes | 6 | A-2513-92 | A-1638-2 | NA |
| 1A170E/JHA | C-5464 C-7726 | A-2973-6 | B-4622-40 | 1/2 | Yes | 6 | A-2513-92 | A-1638-2 | NA |
| 1A135/KCM | B-4446 | A-2973-6 | B-4622-19 | 3/8 | Yes | 6 | A-2513-41 | A-1638-14 | NA |
| 1A170/KFA | B-4273 | A-2973-6 | B-4622-38 | 1/2 | Yes | 6 | A-2513-71 | NA | NA |
| 1A170/L | | | B-4622-30 | 3/8 | Yes | 8 | A-2513-10 | A-1638-13 | NA |
| 1B90/LCM | B-3400 | A-2973-6 | B-4622-10 | 3/8 | Yes | 6 | A-2513-11 | A-1638-13 | NA |
| 1C90/LF | C-1210 | Note 2 | B-4622-7 | 3/8 | Yes | 6 | A-2513-7 | A-1638-13 | A-1639-6 |
| 1C235/LFA | C-7726 C-5464 | A-2973-6 | B-4622-40 | 1/2 | Yes | 6 | A-2513-92 | A-1638-2 | NA |
| 1A170/LL | NA | NA | B-4622-30 | 3/8 | Yes | 8 | A-2513-10 | A-1638-13 | NA |
| 1C90/LM | C-1210 | Note 2 | B-4622-7 | 3/8 | Yes | 6 | A-2513-7 | A-1638-13 | A-1639-6 |
| 1A100/MCM | NA | NA | B-4622-9 | 3/8 | Yes | 6 | A-2513-8 | A-1638-13 | NA |
| 1C172/MDM | NA | NA | B-4622-30 | 3/8 | Yes | 8 | A-2513-10 | A-1638-13 | NA |
| 1C172/MFA | NA | NA | B-4622-25 | 1/2 | Yes | 6 | A-2513-13 | A-1638-2 | NA |
| 1B175/MFC | NA | A-4001 | B-4622-5 | 1/2 | No | 6 | A-2513-16 | A-1638-2 | A-1639-2 |
| 1C172/MGM | NA | NA | B-4622-14 | 3/8 | Yes | 6 | A-2513-19 | A-1638-13 | NA |
| 1C172/MTM | NA | A-2973-6 | B-4622-20 | 7/16 | Yes | 6 | A-2513-38 | A-1638-11 | NA |
| 1A102/OCM | C-4513 C-4593 | A-2973-6 | B-4622-12 | 3/8 | Yes | 6 | A-2513-77 | A-1638-14 | NA |
| 1D200/OM | NA | A-4001 | B-4622-5 | 1/2 | No | 6 | A-2513-16 | A-1638-2 | A-1639-2 |
| 1A101/PCM | C-4513 C-4593 | A-2973-6 | B-4622-12 | 3/8 | Yes | 6 | A-2513-77 | A-1638-14 | NA |
| 1P235/PFA | NA | A-2973-6 | B-4622-28 | 1/2 | Yes | 6 | A-2513-18 | A-1638-10 | NA |
| 1A135/RM | NA | A-4001 | B-4622-2 | 1/2 | No | 6 | A-2513-58 | A-1638-2 | A-1639-2 |
| 1C172/SBTM | B-4425 | A-2973-6 | B-4622-37 | 7/16 | Yes | 6 | A-2513-79 | | NA |
| 1A105/SCM | NA | NA | B-4622-9 | 3/8 | Yes | 6 | A-2513-8 | A-1638-13 | NA |
| 1A170/SFA | NA | NA | B-4622-25 | 1/2 | Yes | 6 | A-2513-13 | A-1638-2 | NA |
| 1A170/SFC | NA | A-4001 | B-4622-5 | 1/2 | No | 6 | A-2513-16 | A-1638-2 | A-1639-2 |
| 1A175/SFC | NA | A-4001 | B-4622-5 | 1/2 | No | 6 | A-2513-16 | A-1638-2 | A-1639-2 |
| 1A105/SLM | C-1210 | Note 2 | B-4622-7 | 3/8 | Yes | 6 | A-2513-7 | A-1638-13 | A-1639-6 |
| 1A162/TCD | B-7925 | A-7952 | B-4622-49 | 3/8 | No | 6 | A-2513-105 | A-1638-13 and A-1638-14 | A-1639-6 |

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Table 1003. Installation Parts for Fixed Pitch Propellers (continued)

| Basic Propeller Model Number | Spacer P/N | Dowel P/N | Fixed Pitch Bolt Kit | | | | | | |
|------------------------------|------------|-----------|----------------------|-----------|----------------|-----------|------------|------------|---------|
| | | | Bolt Kit P/N | Bolt Dia. | Dri-illed Head | No. Bolts | Bolt P/N | Washer P/N | Nut P/N |
| 1A103/TCM | NA | NA | B-4622-43 (NOTE1) | 3/8 | Yes | 6 | A-2513-78 | NA | NA |
| 1C172/TM | B-3821 | A-2973-6 | B-4622-22 | 7/16 | No | 6 | A-2513-35 | A-1638-11 | NA |
| 1A200/WFA | B-3637 | A-2973-6 | B-4622-44 | 1/2 | Yes | 6 | A-2513-102 | A-1638-10 | NA |

NOTE 1: Bolt Kit B-4622-43 contains 6 ea. A-2513-78 bolts, 6 ea. B-73036 mylor gaskets, 1 ea. B-7287 Reinforcement Plate, and 1 ea. drawing B-7387..

NOTE 2: A-1170 bushings are included with the bolt kit.

NOTE 3: For propellers mounted on engines with a tapered/splined crankshaft.

